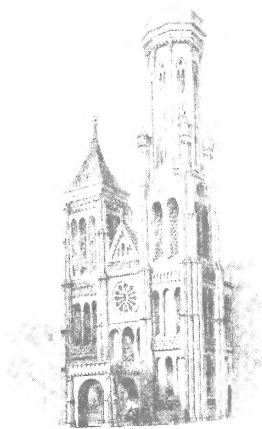




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BRITISH MOSSES.



A decorative border of stylized flowers and vines surrounds the text. The flowers are arranged in a repeating pattern along the top, bottom, and sides of the page.

BRITISH MOSSES,

THEIR HOMES, ASPECTS,

STRUCTURE, AND

USES.

WITH A COLOURED FIGURE OF EACH SPECIES ETCHED

FROM NATURE.

BY F. E. TRIPP.

VOL. I.

"In His Hand are all the corners of the earth."

LONDON:

GEORGE BELL AND SONS, YORK STREET,

COVENT GARDEN.

1874.

QK
543
T92
1874
V.1
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BOT

FROM MY EARLIEST YEARS MY FATHER AND MOTHER HAVE TAUGHT

ME TO LOVE AND TO SEARCH OUT THE

WORKS OF GOD;

AND TO THEM THIS RESULT OF THEIR TEACHING

IS GRATEFULLY DEDICATED.



P R E F A C E .

THE aim of the following pages has been to present such descriptions of British Mosses as should be useful to the amateur who may desire to ascertain the names of such species as he chances to meet with. The language has been simplified as much as possible, and reference to minute detail and intricacy of structure has been avoided where practicable. Those who wish to pursue the study more deeply can do so by the aid of such standard works upon the subject as Wilson's "*Bryologia Britannica*" and Bruch and Schimper's "*Bryologia Europæa*."

The illustrations have been etched on the copper and coloured by hand directly from the living specimen. A few doubtful natives or very rare kinds have been omitted, but with these exceptions every species has been given, and the greater part of them from specimens kindly furnished by Mr. Wilson. The author has also recognized Mr. Wilson's

“Bryologia Britannica” as the authority for the names and localities of the various species.

In concluding the work the author begs to offer her best thanks to those by whose kind assistance she has been able to accomplish it.

DSI

ERRATA.

- Page 21, line 15, *for* “perichaetum” *read* “perichæetium.”
 Page 45, line 8, *for* “Table II.” *read* “Table I.,” line 15, *add* “English” names.
 Page 46, line 28, *for* “contains” *read* “protects.”
 Page 73, line 1, *for* “Arctoca Fulbella” *read* “Arctoa fulvella.”
 Page 78, line 20, *add* “Fig. 13, a, b.”
 Page 79, line 1, *add* “Fig. 14, a, b.,” line 15, *for* “Plate X,” *read* “Plate VIII.”
 Page 85, line 14, *for* “longiostre” *read* “longirostre.”
 Page 99, line 24, *for* “Glaucescens” *read* “Glaucescens.”
 Page 105, line 20, *for* “Augustata” *read* “Angustata.”
 Page 108, line 21, *for* “screw” *read* “lattice.”
 Page 109, line 3, *for* “screw” *read* “lattice.”
 Page 128, line 3, *add* “Fig. 6, a, b.”
 Page 140, line 8, *for* “Uringerum” *read* “Urnigerum.”
 Page 159, *after* line 13, *add* “Locality. Shady places in sub-Alpine districts.”
 Page 176, line 17, *for* “Minoides” *read* “Mnioides.”
 Page 178, line 1, *add* “Fig. 12.”
 Page 185, line 9, *add* “Fig. 7.”
 Page 188, line 13, *for* “stems” *read* “stem;” line 18, *add* “Fig. 17.”
 Page 192, line 8, *add* “Fig. 8.”
 Page 193, line 1, *add* “Fig. 10.”
 Page 205, line 17, *add* “Fig. 18.”
 Page 212, line 8, *for* “Articum” *read* “Arcticum.”



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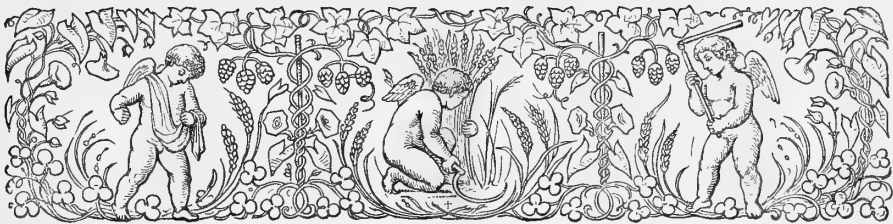
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INTRODUCTION.

SECTION I.

THE HOMES OF MOSSES.

“Rocks overlaid with velvet and fur, to stand on in the first place. If you look close into the velvet, you will find it is jewelled and set with stars in a stately way.”—RUSKIN, *Notes on the Exhibitions*, 1859.

T was the third day of creation. God had gathered the waters together, and the earth appearing, it lay under the new-born light, silent, and still, and bare. But when the light dawned for the second time, He spake the word, and the brown land flashed suddenly into a thousand hues. The green grass came forth; the reeds sprang up by the newly-formed watercourses; afar off, where the sun was to burn, rose the forest with all its flowers in their glorious beauty, that beauty which should even cause the Creator to rejoice in Heaven; the northern pines stood up, row after row, like the pillars of a temple; the southern palm waved its lovely head; the kingly cedars were planted beneath the snows of Lebanon; and on the slopes of the Himalayah the rhododendrons blazed in scarlet, and gold, and orange, to be kindled into greater splendour when they caught the sun's first rays; and for us, in our island home, God set the daisies among the grass to gladden the hearts of little children, and in that wondrous spring-time called out the primroses in the woodland dells, and spread the purple heather on the mountain sides, and bade the golden furze fill the air with its scent.

And not only was the earth's greatness adorned, for its very smallest corner

was filled with vegetable life. One family of plants was created, by their low organization fitted to exist anywhere, by their varied food to find nourishment out of every possible substance, by their minute, invisible seeds to gain entrance into the tiniest crevice, and, by their wonderful formation and exquisite beauty, to bear witness to His power and skill and love throughout all lands. This family of plants was in former days called "cryptogamic," or "hidden fruited," it is now known as the "cellular," and the "acotyledonous." Why it has these names it is not now our purpose to inquire; but, to know of what plants it consists, let us call to mind those shade-lovers, like forest-spirits, transformed but not stilled,—the ferns; the strange, mysterious children of darkness and decay, coming out in their scarlet, and orange, and brown, and looking at us in their uncanny fashion, witnesses that death is the gate of life not to be numbered for multitude,—the fungi; the waving crimson banners and purple plumes down in the depths of the rock-pools, whose name but to mention seems to bring the fresh wind into our faces, and the dash of the waves to our ears,—the sea-weeds; the orange stain, which is time's finger-mark on the grey wall, and the cups with scarlet edges spread for fairy banquets,—the lichens; the soft green beds into which our feet sink, and all the loveliness which we think of when we think of—mosses. And of mosses, in their homes, their aspects, their structure, their uses, we now intend to discourse.

But we pause. At the very idea of studying mosses a clamour of objections arises, as loud and as confusing as the chatter of the black stones when the princess went toiling up the hill after the golden water. Mosses! Mosses upon the wall! there can surely be little to say of them. Mosses! there must be so much to say of them that it is hardly possible to learn it. There is no use in a book about what we have no hope of understanding. Mosses! they *can* be understood, we suppose, but they are so extremely difficult, and they require you to put your eyes out in looking through a microscope; and Mr. Jones, the naturalist, pokes into the hedge until he finds out a little atom you can hardly see, and he says triumphantly, "It is *Phascum Subulatum*!" and we have no taste for hard names, and we never heard a moss called by a plain one. Thank you, we do not wish to know anything about mosses.

Certainly, if we listen to the black stones, we shall never do anything worth the name of *doing*; so we may as well stuff our ears with cotton and push bravely

up the hill, and try, at least, if there be not something at the top to repay us for the toil. For there *is* a little to say even about the moss upon the wall; and as to the difficulty in the way of the study, was any good work ever wrought save by the *might* of the hand that did it? We are not called to do great things perhaps, but surely we are to do *good* things; every one of us is bidden to fulfil the purposes of his existence, to occupy his appointed niche in the world, to leave nothing undone which he has been commanded to do. And one purpose of existence, God Himself has told us, is the searching out His works in order to praise Him better when we know them. The way to fill up our niche is to stretch ourselves out on all sides of it, until we completely follow its canopy work and its carvings. One thing which God has desired us to do, is, to “consider the lilies of the field, how they grow.” And in “considering” mosses, though we ought to do it because it is our duty, we shall find much pleasure. We shall not, probably, make any scientific discoveries of importance to the rest of the world; but we shall find out many curious and wonderful things, which will be discoveries of much importance to ourselves. We shall employ no hard words until we fully understand and need them. If we use a microscope, we shall find the irksomeness fully repaid us by all that will be revealed by it; but for a long time we may get on only with the sight which God has given to everybody for the purpose of beholding His works. For collection we shall require no implements beyond a basket to carry our mosses in, and for preservation an old thick book to dry them in. And if you follow these pages, I hope that, by the end of the week, *you* will be poking into the hedges with your friend Mr. Jones, and that when you find it you will not be sorry to know the name of our tiny *Phascum Subulatum*, any more than on meeting an acquaintance you would be sorry that he had some appellation to distinguish him from other men, how little euphonious soever that appellation might be.

About mosses an enthusiast says,—

The dear, delightful, little things,
We meet them every where!

And this is true, not only of mosses in general, but of particular species of the family. Brave and hardy, they are chosen with the lichens to occupy the extreme outposts of the vegetable kingdom; but the faces of this advanced guard, wherever they may be found, are familiar enough. One of our English mosses grows

on the highest plant-line of Chimborazo,¹ another is among the five which Dr. Hooker discovered at the "Ultima Thule of antarctic vegetation, Cockburn Island, lat. 60° 24' S."² Going northwards, the list of mosses appended to Sir J. Franklin's "Journey to the Polar Sea," consists of British species; among them being some of the fork mosses, which grow in thick tufts, called by the Indians "Women's Heads," because they say, "when you kick them they never get out of the way." The earliest plants to spring from the bare rock, the first to clothe the soil after the burning of the forest, the last to linger in the recesses of the cavern, the latest in the year to flourish and bear fruit; heeding not the mountain storm, nor the arctic snow, nor the poverty of the soil, nor the darkness of the cave, nor the dreariness of the winter, the moss defies also the burning sun of the tropics. And there it has made the desert rejoice, and by its beauty has roused the fainting courage of the wanderer, as Mungo Park has told us of himself. By strange contrast the moss³ which he saw in the dry and sandy waste chooses for itself in England the most cool and damp habitations; and we have no law which will account to us for the fact that these plants which, of all others, are the most sensitive to atmospheric influences, should at the same time be found in every variety of climate. It must be placed with those other mysteries, the love of the vervain and the henbane for human habitations, and the attachment of the plantain to the Englishman; but of this we are sure, that when the moss was set in the desert 5000 years before, He who bade it spring knew to what end its exquisite fashioning should serve.

Universally distributed over the earth, and some species found in all parts of it, mosses seem especially to love cold and moisture, and their homes are therefore pre-eminently the arctic and temperate zones, and the heights in the torrid which correspond with these in climate. As, therefore, we advance to the higher latitudes, or mount to greater elevation, we find the proportion of mosses and lichens to the other forms of plants increase, until they compose the whole of the vegetation; and in going back in creation's story, we learn that the moss type of plant has only very recently been introduced upon the earth, when its temperature was gradually lowering.

¹ *Orthotrichum phyllanthum*.—WILSON'S *Bryologia Britannica*.

² *Bryum argenteum*.—HUMBOLDT'S *Aspects of Nature*, vol. ii.

³ *Fissidens (Dicranum) bryoides*.—HOOKER'S *British Flora*, vol. ii. pt. i.

Tabular View of the Geographical Distribution of the principal Acotyledons; according to the region or the height at which a corresponding climate is reached. The luxuriance and prevalence of each tribe are denoted by capitals. The height in feet is not given, this varying in different latitudes.

Arctic or Ant-arctic. (Mountain top).	LICHEN. MOSS. Club-Moss. Fern. Fungus.	SEA WEED.
North Temperate.	LICHEN. MOSS. CLUB-MOSS. Fern. FUNGUS. Equisetum.	
South Temperate.	LICHEN. MOSS. CLUB-MOSS. FERN. FUNGUS. EQUISETUM.	
Tropics. (Mountain foot).	Lichen. Moss. CLUB-MOSS. FERN. FUNGUS. EQUISETUM.	

Of the 3800 mosses and liverworts which Humboldt estimates as the present number of their species, about 447 mosses are found in the British islands. For their perfect development they require the state of atmosphere obtained at a high level, combined with continued damp; and these conditions are fulfilled in the loveliest regions of the earth, the valleys which radiate on all sides from a mountain chain. High above the sea-level, their steep sides condense the moist atmosphere attracted by the hills, and here, therefore, is the glory of the moss. These valleys are the loveliest regions of the world in form, in skies, and in clothing. The curves of their sides, the perpendicular lines of their rock buttresses, are the grandest of Nature's lines. Above their heights are silently built, day by day, cloud temples such as lowland dwellers never see, snowy ramparts and golden pavements, which in an hour appear and vanish and leave no ruin, and yet are in appearance the thing we know most like the building of God, which is eternal in the heavens. Here the trees spring and grow

every one as if it had a duty to fulfil in adding to the beauty of the spot. Here is all the loveliness of the wildness, and all the richness of the cultivation, and all the moral beauty of the cultivation also, as we know what toil and labour must have been gone through before even yon little patch of corn, like a green kerchief on the hill-side, could be set. Here the flowers grow, some in the clefts of the rocks, some in little hollows below them; some scattered over the slopes, others by the foaming streams; and the open ground of the heights is jewelled with blossoms, pencilled eye-bright, and purple bosses of clover, and four-petaled tormentil with its finely-cut leaves, and sprays of heath, and milkwort, every blossom like a very tiny swallow held fast by its beak, purple, blue, pink, white, among the fine, short, shining grass;¹ flowers in a flat country never grow like these. And the mosses themselves give such richness to every spot that not only do they find the fairest homes, but, like grateful children, do their utmost to make their homes more fair.

These valleys are very much alike in general features, but every one has its peculiar character. One will have the grandest rocks, another the wildest woods; one the most rushing torrent, another from its heights the fairest outlook of winding stream, and green meadow, and sloping coppice, and far away blue cloud-like chain of distant hills. And for a moment let us think of what the year brings of change into their quiet.

In winter there are mosses in all the brightness of wet green. Fleeces over one rock, arabesques quaintly spreading on another, little brown threads rising from a third, feather tapestries hung from every hollow, and long peninsulas of green mapped out on the tree trunks. Later in the year, from among the moss rise green rolls to be unfurled into arum leaves, green points to be spread out into hyacinth stars; here is a "red robin," pink flowers and bronze and scarlet leaves lying on the emerald velvet, and there, just where the moss is brightest, and sprinkled with diamond drops from the rill, crawls a vermilion speck of an insect, come out to enjoy himself in the sun, and to make a little "bit of colour" for us. And the moss itself is full of bird-like heads, drinking in every particle of moisture, and not yet crisped by the sun. Wait until mid-April, and then go into the

¹ I know of not one description giving any idea of the peculiar enamel-like character of these flowers, excepting in Dante, *Purgatorio*, Canto xxxviii. when he sees the Countess Matilda.

valley. Nestled among the stones is the wood-sorrel, fresh, three-parted leaves, delicate, pearl-white, semi-transparent bells with lilac pencillings; how the moss-feathers have laid themselves around the leaves, and how soft a bed, even in that stony place, has been made for the exquisite nursling! Under the hedge the ground fairly shines with the golden saxifrage, and above, the air is musky with the scent of the green adoxa, and there are primroses everywhere; one springs at the mossy root of the tree, blossoms clustering among the crumpled foliage, another root looks down from the dark cleft of the rock, and another goes back to light the hollow where the green dog's mercury comes about her; and the golden saxifrage makes the ground look as if angels had trodden it in the night and left their shining foot-prints; and the primroses are like their robes laid down. There is a thicket in which dead brambles and sprouting ones and arum leaves are all tossed together. And climb that steep path, and go among the rocks and on into the coppice, and you will find it full of wood-anemones. Every day some fresh leaf springs, some new flower opens, until, by the beginning of May, hyacinths curl over the ground like blue smoke, and wild strawberry blossoms fall like little snow-flakes, and purple orchises are sullenly handsome among their spotted leaves, and the tall sedges wave; and on the uplands rolls a golden sea of furze, and beyond those golden billows is the deep blue line of England's girdle. Later yet, and the marshes by the stream have the "gold sovereign" blossoms of the water ranunculus, and the white-fringed bog-bean; and the dragon-flies come out in their green armour, and the sun's rays will have curled and crisped the moss, and made it all amber and brown; and later yet, we shall lose sight of it. But we shall come into the valley still; for there will be tangles of honeysuckle, and dog-rose, and purple vetch, when the hawthorn is gone; and the foxgloves will stand like sentinels on the rocks, and among the spongy bog-moss will be the pink pimpernel and ivy-leaved campanula, and crimson-haired sundew all pearly, and golden asphodel; and we may stand among the meadow-sweet that is almost breast-high, and look all round upon its foam, and to do this, and breathe its scent, and hear the chiming of the brook the while, is one of earth's joys. Yet again in autumn the ferns will be there, with their malachite vases set with brown tessellated work, and stately tossings of osmunda, and ribbons of harts'-tongue, and minced spleenworts trailing from the rocks. And when the ferns are dying, and the leaves are falling from the trees, we may see the green gleams

telling us that the mosses have had their siesta, and are awake again in the cool damp air.

Now, if we wish to know what these valleys are like, we must go far west into North Devon and wild Cornwall.

“ And so, Mr. Rubric, you really are going into Cornwall,” said an old lady once to a clergyman of whom she had heard the astounding intelligence that he was going to leave the quiet cathedral town, and take a living there. She had just heard, too, of that rash experiment of sending a bishop to New Zealand, and she compared the two things in her mind, and said with a sigh, “ Well, I suppose it *is* better than New Zealand !” And such, perhaps, is the feeling of half England towards the western peninsula.

With how many inlanders have we gone over the Cornish moors, and how often have we marked the struggle between truth and politeness when they have been asked “ if it wasn’t glorious !” To be sure, they could hardly keep their eyes open for the wind, and perhaps had just recovered from a peppering of hail, and the question was not quite fair under all the circumstances. But a Cornish moor *is* glorious, nevertheless.

Wide, apparently without limit to its rolling, bronze and green, and in the autumn as if molten amethysts and rubies had been poured over the ground, with rough gold flung among them for setting, of purple heath and dwarf furze in the sunlight ; heights of granite above, mysterious Druid-circles here and there, wonderful brightness all round the horizon, because the sea is behind the hills, this giving such expanse and infinity to the view that one almost anywhere else seems cramped and confined without it ; the ground in many places full of pits where the peat has been cut, these in winter filling with water, and the reflected blue of the sky and the chocolate of the bed of the pool mingling together into such sapphire tints and purples that we were told by one who had travelled far and observed much, that never in England had he seen water of such lovely colour ; streams rippling over beds of yellow sand where the trout play, and crimson sheathed rushes glow in their currents ; wide tracts scattered over with the feathers of the cotton grass ; unfathomable bogs or “ pixie-pools,” whereof horrible tales are told of engulfed horsemen who had the fate of Curtius without his desire for it ; flocks of geese, and herds of red cattle roaming about and staring at you in quiet surprise at the intrusion into their territory. In

summer burning under the sun, the grass slippery with the heat, lizards darting in and out of the tufts of rushes, and yellow frogs hopping in all directions, the whole horizon quivering, the whole air full of fresh perfume, every sound coming from a long distance; sometimes, when it is stillest, the cuckoo's voice sounding from the thicket which is far away, and then the humble-bee booms by, and the boom dies off into a long hum. In winter the south-west gales roar in from the Atlantic, and bring the voice of the waves with them; and if you have never stood upon the Cornish moors between October and April, you have yet to learn the meaning of the four letters which make the name of the rough but true friend WIND. Then away over the moors and the sea-coast is reached; in the north, of purple slate-cliffs with little bays gashed and rifted in their flanks, and the sea the colour of malachite and lapis-lazuli, breaking on the blue-black rocks into foam like molten silver; and in the south, of broken cliffs and grassy slopes, and hangings of brushwood, and oaks whose leaves are wet with salt spray, and smooth silver sands.

Back to the moors again. The air is all one song of blithesome larks, though for human sight and sound we listen in vain. Only in one other place, in a vast crowd, is utter solitude. But there the multitude hope with a common hope, joy with a common joy, sorrow with a common sorrow, and if not a face among them look on us with recognition, our heart goes forth into the mighty human heart; we know that our brotherhood is with the great human family, and our heritage is immortality shared with a multitude which no man can number, our eternal home is filled with many voices like the sound of great waters. Here, under the vast hills, we see our insignificance. Thou, the Maker of this, who hast set fast these mountains and stretched out the heavens above them, what is man that Thou art mindful of him? We have the answer at our feet. One hand set fast the mountains, and fashioned the moss that clothes them.

The mosses are in thick soft cushions on the rocks, and lying like fur upon the ground; in the bogs are mats of long, straggling moss, crimson, lilac, whitish brown. The chinks between the rocks are filled up with mosses and their cousin lichens, the hollows are thickly carpeted as for an elfin festival, and tiny caverns among them are decked with lacework, and feathers, and patterns of braidings in and out, and curiously set stars, and green and silver threads interlaced; and all this wondrous delicacy of wrought work, is the more wondrous because of its contrast with the rough rocks it lies amongst.

Following the track that leads off the moor, we find that by degrees it takes the form of a road ; that is to say, the cart-tracks become deeper, the grass more worn, the loose bits of granite lying about promiscuously are rather smaller. Then a hedge appears on each side, of granite rocks of various sizes, large or small as they fitted or filled in. All the rocks are crusted with lichen, and long bents of grass straggle from the crevices. The hedge begins to be bushy with heath and whortleberry ; presently we see a stunted hawthorn, which shows us by its growth from which way the wind blows ; and now we reach a hamlet set in a hollow of the hill's great shoulder, and the first trees we have seen are the sycamores among the rough walls of its cottages. Such lovely children come out to look at us as we hardly believed were found out of picture-frames, with great hazel and blue eyes and long lashes, and scarlet blood mantling in their cheeks, and golden hair curling over their heads ; and there is a general assortment of domestic animals, goats, pigs, a stray sheep or two, huge-horned red oxen going along in a leisurely way, and a flock of geese. At a sudden turn of the road the valley opens upon us ; the curves of its steep sides passing up into the lines of the tree trunks and rocky buttresses, which make one wild beauty, and farther down the rocks becoming fewer and the coppices larger. The road is cut, terrace-like, in the side of the hill ; the green of the grass on the slopes and hollows above meets the blue of the sky ; here the slope is broken by a rock, there is furze in blossom, and on the opposite side is a slope as steep, set over with hawthorns, milk-white each one, and the mountain ash waves, and the clumps of hazels have mossy stones beneath them ; and, after the open moor, it seems as though we never before appreciated trees and shade. The hedges are passed, and the turf on each side comes close to the road ; and far down is the brook, now tumbling, roaring, leaping over the boulders, and now quiet in dark purple pools. Rock, and smooth slope, and coppice, and turf spread by the brook, and oaks stretching their limbs across the stream, and shade of hawthorn, and the voice of the woodpigeon from the thicket, and the joyous song of the water, and everywhere the flowers and the mosses, and the look up the stream to the purple moor it and we have come from, and the grey church tower with trees clustering round it, and the bridge of piles of rock with slabs laid across from one pile to another,—such our valley is. And the farmer who cultivates it will say that for more than two hundred years it has been in the hands of his family, and that

one of his ancestors was hiding among its rocks when Cromwell came, and he would not transfer his allegiance.

It was soft grey weather in early May, and as we rode along to one of these valleys, the air was so full of the scent of the furze that we seemed to bathe in perfume. Crossing the hill-side, on our right was its steep rough slope, before us the wide country, a broken foreground of woods, and granite tors above them, and one chain of hills rising after another, until the farthest range was lost in the grey sky ; and at the foot of the hill the mountain stream came out from under the oaks, and little rivulets dashed and sprang away to meet it, and all together went their way among the rocks and hills to the distant sea. We went down the cart-track to the water-side : here were deep pools, amber, and brown, and purple ; and there were falls over the rocks, and boulders lying about on the ground, as if a giant had been rolling them till he was tired, and had left them there for the moss to grow on them ; and in a cleft in the rugged bark of one of the oaks a seed of woodsorrel had sprung, and the leaves and flowers, that a touch could bruise, lay in the roughness and brownness. Across the stream was a space of ground contested by the furze and the coppice, the furze-bushes all masses of gold, and through the furze-bushes and the hazel we came into the coppice itself. It was not yet full-foliaged, but here and there broad bits of green hung on the hazel boughs,—the banners of the triumphant spring. We left our horses in the open ground to enjoy themselves, and followed the coppice path, which led us to the remains of an old fort, supposed formerly to have been a defence for cattle, now only a huge mound overgrown with moss and brushwood. Here came the midday sun, and up among the moss and the brushwood, to meet him, rose the very loveliest host of flowers that ever he called forth. Whortleberry, millions of pink waxen bells, and the honey-drops like jewels as they caught the sun ; woodsorrel among the moss ; the earliest wild hyacinths hanging their bashful heads, as a child looks at you from among its curls ; primroses not caring where they grew, so they *could* grow and bring their quiet beauty and their scent to the spring-time's happiness ; and countless blossoms besides, more than can be told. And from the summit of the fort we looked over into a deep hollow in the wood ; its banks rose around, and the hollow was, as it were, a reflection of the sky, for it was absolutely blue with hyacinth, and the blue was starred over with the wood anemone. There were thickets of underwood ; honeysuckle, bramble, and dog-rose, and a wonderful emerald lacework was cast

like a veil over all ; and the half-unfolded, transparent oak-leaves made the trees seem dropping gold ; and the birds sang and sang, and stopped a little, and burst forth again, and hushed ; and one thrush took up the strain, and ceased ; and the cuckoo cried from the depths of the wood, " Spring's here ! Spring's here ! "

The north-western part of Hampshire is formed by a district of high table-land ; it is full of wild bits of country called " commons," vast thickets with trees standing up amongst them, the purple and red of whose fallen leaves make, with the green mosses, colouring which is beautiful exceedingly. We entered once upon a common from a bare flat, whence we passed under the shadow of the beech trees ; the ground slopes away ; the beech trees stand in regular rows along on the hill-side, their roots forming terraces covered with short spare turf ; but immediately at their feet are spread cushions of green star-mosses, with little capped heads, and sometimes, for the whole space between two trees, the ground will be covered with stars set close together like a nebula of moss, and then the nebula will be lost in the turf which comes in the open ground. It is, perhaps, the almost entire absence of other vegetation which gives a beech-wood shade its peculiar character of absolute quiet ; and this beech wood in particular is still. The great limbs of the trees are untouched, the light clouds of their young foliage are undisturbed, the mossy carpet is undented by a foot-mark. Passing on into the shade, and descending the terraces step by step, a long avenue opens ; the beechen giants stand up at regular distances, behind them, on each side, are rows of younger trees, whose trunks are at as even distances as cathedral pillars, and the long silvery perspective reaches two miles away ; between the pillars is the smooth floor of turf, and the smoothness is more smooth, and the regularity more regular, because the beech avenue divides a dense, wild thicket, above which, a green island from the sea, rises here and there a holly or a pine. Strange, enchanted like it is, to come from the still wood out into the length of the avenue, and see, far away upon the turf, the wind whirling round a handful of dead leaves in wild and mystic dance.

We have said that it is the condensed vapour in the Cornish valleys which makes the climate so favourable for the growth of the moss ; and the coming in of the vapour from the sea is often a wonderful sight. The cloudless blue sky is suddenly overcast by a thick mist, so impenetrable that nothing can be seen through it ; as suddenly, while the thick grey gives a curious impression that you are " no where,"

the mist opens at a long distance off, and reveals a bright vignette-like patch of sunlit country, over which it will as quickly close again. Very similar to Cornwall is the beautiful district of North Devon, and in the "Valley of Rocks," near Lynton, we have seen a remarkable effect of this sea-fog, which the Cornish say "is all fur yitt un pilchards." It was in December. The valley of "Waters Meet," crag, and brown wood, and mountain wall standing sheer up from the river's edge, lay steeped in the winter sunshine, and the brow of the hill rose against an unclouded sky. The only sound in the stillness was the rushing music of the torrent's march. Mounting the hill to Lynton, and looking up for a moment, the sky appeared suddenly filled with huge falling snow-flakes; but those great feathers were flakes of mists, and strange as had been the look of the sky, as though it were closing in and coming down on us, yet more strange was the sight in the "Valley of Rocks." Itself many hundred feet above the sea, the "Valley of Rocks" is between hills covered with rocks and stones in fantastic shapes, pinnacles, spires, heaps of stones as if for an universal road-making, buttresses, and castles. The sky above was blue, but the valley was full of mist, white as the driven snow; sweeping up the hill-sides and hanging among the rocks in forms more fantastic even than they. It was like a dream. There was no perceptible wind; but the mist-wreaths varied at every moment: an entire summit was hidden, and the mist sprang, as it were, and divided into a thousand fragments,—these trooped off in a spirit-dance; a grey wall of vapour stood up, slowly and slowly it rifted from the top to the bottom, and its *débris* disappeared with a whirl and left the turf and the rocks quiet beneath the sun. Anon came a white curtain, hiding sky, and sun, and sea; but even as we gazed it was rolled away and gone; and all to us was new and strange, for we had never been in the valley before, and could not tell what the lifting of the curtain might reveal. Down the coast, where the woods grow to the very waves, midway along the heights lay silver wreaths of cloud, and coming round the cliff-path and looking across Lynmouth Bay, we saw the bay filled with a cloud, like an Alp, its summit a thousand feet above us, so near that we could have plunged into it, and we could tell all its hollows, and its shades, and its depths, and its heights, and its brightness as the brightness of the sunlit-snow, towering up white into the blue heaven, and its base becoming thinner and more thin, until it hung as a veil over the sapphire waters.

These mists stalk along the granite heights in Cornwall in ghostly processions,

as of Druids with their grey hair streaming on the wind, and after a long day spent in hunting out Druidical antiquities, the October evening closed in on us, the sky flushing crimson, and the mists marching off the hills in weird pageant, as if the Druids had come back in sullen anger to behold the profanation of their shrines.

One more memory and we leave cloud-land. It was evening, and we rode quickly up a tor, expecting to see the sun setting into the ocean; before us were round granite hills, beyond these two serrated heights, and instead of any view of the sunset, we saw, behind all, a great mist towering up, and taking the form of a range of mountains. The skirts of the mist hung over the true hills, magnifying them to double their real size, and, rising before the sun, the tops of the mimic mountains became golden, and the mountains purple, and that mountain-range was a vision of such glory as it is not in words to tell. There were deep ravine and castled summit, and cataract hasting from the heights, and river, and broad lake, and fleecy clouds hovering on the mountain-sides, making them "hills of angels;" cloud and cataract and castle were in golden light, and ravine was in purple shadow, and all were changing at every moment into more glory and more wonder: and then the mountains towered higher and higher, and bowed their mighty heads, and swept down the hollows between the granite as billows of mist; and we heard the shouts of our companions from below,—“The sea-fog!” and as we joined them a billow swept over us, and all was grey.



SECTION II.

THE ASPECTS OF MOSSES.

Annihilating all that's made,
To a green thought in a green shade.

ANDREW MARVELL.



FOR learning the aspects of mosses no better way could be devised than taking a walk in the country, and looking at every one we find. For, though mosses are finest and most abundant among the hills, types of their principal forms may be seen in every district, and we may begin our examination with a moss,¹ which, in all probability, grows on the first wall we come to. It is in round green cushions, velvet-like, covered with little grey hairs, and rising from it are brown threads touched with orange. On looking more closely we see that our cushion consists of a multitude of stars, set very closely together in a pattern which would serve for the background of an illumination. If we pull the tuft up we can separate the stars. By what have we pulled it? By the brown threads. These end in an enlargement, finished in a curved point; detach one, and you have a perfect moss-plant; a root, then a star of green leaves, from the centre of which leaves rises a fruit-stalk, this ending in a seed-vessel. From another plant the little pointed cap of the seed-vessel has come off on your finger. But with cap and head just at present we have nothing to do; all that we have to remember is that mosses, bearing their fruit from the centre and summit of the plant, are in general formation like this one; they are usually found on stones or on the earth, and are pretty firmly attached to whatever they grow upon; both from being so closely packed together, and from their having just root enough to hold them. The great rambling, shaggy, fleecy mosses in the hedges, and the thick carpets under the trees, have also their distinctive features.

To find these mosses, let us go on to that avenue of oaks. Pleasant it looks

¹ *Tortula muralis*.

at a distance, pleasanter is it to get there. The red of the wet, fallen oak leaves is magnificent; there the wet reflects the sky colour, and the leaf is deep purple. Oh! what it *is* to hear the dead leaves rustle under your feet! Do you not remember, when we were children, how each of us tried which could make the most noise with them? From under the red and purple we catch gleams of green, like emeralds,—like that brighter, purer green yet of the *chrysoprasus*, which tells us what the colouring of heaven will be; but in the falling of the light upon it, the deep, velvet shade, the brilliant lustre, that gleam of green moss is like a humming-bird's breast. And as the feathers on a bird's breast, the feathers of the moss lie over one another. Feather-mosses everywhere, like Mexican hangings upon the tree-trunks, in mats about their roots, making the hedges beautiful. Pull a tuft of feathers from this golden green mantle.¹ The plummy things have bright red stems, branching off on each side and branching again, and all are covered with amber, close set, shining scales; and from the middle of the main stem, not at its end, grows a brown, thread-like fruit-stalk, ending in what is very like the head and beak of a bird. The feather mosses have always the fruit on the sides of the branches.

A type of a third form will be seen in any swamp or bog. It is a loose-made, coarse-looking, whitish-brown moss,² which bears its fruit at the ends of short branches; the plant having much the form of a candelabra. Under the three heads, therefore, of star, feather, and candelabra, we may, for the present, arrange all our mosses; and we will now enter into detail concerning the most remarkable in each division.³

Beautiful indeed is a mossy hedge. It is full of nooks and corners, and hollows and crevices. One nook is tapestried with minute transparent green feathers, from each issuing a thread with a pointed scarlet lid.⁴ At the entrance of another a root has descended from above, and the moss has made wreathen work around the pillar, and formed a fretted arch, like the entrance to a temple. Here are

¹ *Hypnum splendens*.

² *Sphagnum*.

³ If any scientific reader looks at these pages, I must entreat his patience with a classification adopted solely for a temporary purpose, viz. the familiarising the unscientific with the "aspects of mosses" before entering on the difficulties of structural examination.

⁴ *Fissidens bryoides*. "Mungo Park's moss."

little fibres, dusted by a lichen with a grey powder, and there are great mats of feather-moss, among which now and then appear clusters of stars. Cushions of velvet, tufts of bright silvery leaves, embroideries neither like lace nor window frost, yet reminding us of both ; filmy veils, cut and minced and gashed as it were every way, yet every cut and gash forming part of a quaintly intricate device, some mosses armed with a *cheveux-de-frise* of stiff, bayonet-like leaves, and drawing themselves together into compact clumps, others soft and furry ; grey and russet, emerald and scarlet, purple and orange, so has the Beautifier of the earth made them. Strangely, also ; for the forms of these humble things are in many cases those of the grandest and most gorgeous of all natural objects. The star links together the heavens above our heads and the earth beneath our feet ; and the Maker telleth the number of the stars, of the green stars of the earth, as of the golden stars of the sky.

“In His hand are all the corners of the earth ;” a corner remote enough is the top of a bank in a moorland district. This is sometimes covered with a star-moss,¹ whose leaves, dark green and rigid, thickly beset the stem ; from the middle rises the fruit-stalk, orange-coloured, deepening near the top to brown, and wearing a conical cap covered with silky yellow hair ; the golden hair and orange stalks and green leaves shining beneath the blue sky. This moss is an aloe in miniature ; and on many of the stems, in the centre of the circlet of leaves, is a crimson cup, as perfectly like a cactus-blossom. A sage-green moss,² common on rocks, has at the end of every branchlet its fruit, like a coral bead. The fruit of another is at once described by its name, “Apple-moss.”³ One family of star-mosses is appropriately designated the “Swan-necked,”⁴ so lovely is the curve of its fruit-stalk ; another might be named the “Crane’s-billed.”⁵ But, strangest of all, to an obscure moss⁶ has been given the form of that which is at once the stateliest and the loveliest of all green things, the date palm tree.

The coral-beaded one is the only candelabra-moss having any special beauty. Feather-mosses have less variety of form, but more of colour, though even here is the same quaint imitation in the shape of the spruce fir tree.⁷ The tree form is

¹ *Polytrichum piliferum.*

² *Hedwigia ciliata.*

³ *Bartramia pomiformis.*

⁴ *Mnium.* ⁵ *Atrichum.*

⁶ *Mnium undulatum.*

⁷ *Hypnum triquetrum.*

taken by many. In damp shady places the rocks often appear to be covered with a dark-green fleece.¹ But if the hand presses this fleece, it is buried in its depths. A tuft of it is like a miniature grove, a leafless, scaly cluster of stems often six inches long, perfectly upright, and divided at the top into feather-like branches, which bear the seed-vessels; holding the tuft up to the light, the resemblance to a wood is perfect: and it is upon the tree-like character of another moss,² closely allied to this, but found in marshy places, that Humboldt bases the supposition that there may be forests of tree mosses in some yet undiscovered region, as there are known to be forests of tree ferns.

Some day, even in this well-explored world, a traveller will slowly descend a steep, and look over a parapet of rock upon a new vegetation in the hollow of the valley below him. Deep, dark green are those plummy branches; but now the western sun breaks forth, and the many sides of the silken leaves give back strange lustre. Soft, velvet-green is the shade, it must be still there; and coming down underneath the trees the very breath is hushed, for the silence is to be felt, there is only heard the tinkling of the little rills which keep the moss-trees fresh. Quietly stand those grey, silver-scaled trunks; the wind lifts the heavy plumes, but makes no sound as it stirs them; softness everywhere, for even that bright-eyed creature who ran away, how downy his coat was! And how the foot sinks, and no fall is heard on the furry ground! Look up, there are such leaf-patterns as were never seen before, save in a morning's frost-work. And all this is green, the very light is emerald, only a solitary flower, crimson or gold, is set here and there, like Venus alone in the evening sky; no blight rests upon the branches, nor do the leaves fall, and the earth has upon it no dead. Is this anywhere among the thousand islands in the unknown sea?

¹ *Isoetecium alopecurum*.

² *Climacium (Neckera) dendroides*. See "Aspects of Nature," vol. ii.

SECTION III.

THE STRUCTURE OF MOSSES.

One Spirit, His
Who wore the platted thorns with bleeding brows,
Rules universal nature.

COWPER.



THE family of which mosses form one division is distinguished by the names of *Cellulares*, or cellular plants; *Acrogens*, or summit-springing; *Acotyledons*, or without seed-leaf; *Cryptogamic*, or hidden-fruited; according as the botanical arrangement is determined by their texture, mode of growth, or structure of fruit: and these names will form good ground for our present observations.

Mosses vary in size from the minuteness of microscopic objects to the height of five or six inches; and in growth from separate plants found in tufts, to masses of creeping roots throwing stems up to the surface, which may extend for many feet. They are never found quite solitary, for, even if the plants are detached one from another, several will be near each other. The root does little more than attach the plant to whatever it grows upon, and in the *Sphagnum*, or bog-moss, it is entirely wanting. More may, some day, be discovered of the functions of the root; but, at present, it is believed that mosses derive their nourishment from the damp of the surrounding air, through the cells of which they are composed; hence the classification of mosses as *Cellulares*. The cells, being damp, spread out, and the moss is fresh and green, but the moment that the moisture is evaporated from them they close and the leaves shrivel up. There is no connection between the cells, therefore one part of the same moss will revive on being wetted, and the rest of it will remain dead and dry; even a shower will cause the crisped and curled leaves to open; and a moss may be pressed and dried for years and come to life again on being immersed in water. The species *Schistostega pennata* resists damp, and the circumstance of the *Splachnum*, or flagon-moss, being invariably

found on decayed animal matter, may countenance the belief that through the root food is supplied to the moss as to other plants.

Besides a root, a moss has stem, leaves, and fruit. The stem may be with or without branches. The leaves next come under consideration. The cells of which they are composed are of various forms, the most remarkable and beautiful being found in the *Sphagnum* group, the *Mniums*, and the *Hookeria lucens*. One general form in each genus is maintained, but they are very irregular in size and arrangement. (See Illustrations). The leaves themselves differ much in shape; very rarely they are divided, but their edges are often serrated. They may be lance-shaped, scymitar-shaped, sickle-shaped, awl-shaped, egg-shaped, sometimes between lance and egg shaped, set flat to the stem, which then looks like braidwork, or set out from it all round, as are the hairs of a fox's tail; very often they twist every way when dry, and again when dry they may be waved cross-wise, or furrowed length-wise. In size they vary between minute close-pressed scales, and broad, gauze-like, waved leaves, nearly half-an-inch in length; they have no sap-vessels, but often possess one or two nerves, which nerves reach half-way up the leaf, or sometimes less; and when the nerve is single it frequently runs out into a point beyond the leaf. The leaves of mosses may also have thickened margins; but in both form and structure are many more varieties than these. The principal ones only are here named, and the others will be learnt when each moss is examined in detail.

Those who have observed the formation of an ordinary seed will know that it consists of one or more lobes, at the base of which is the bud, designed to develop afterwards into the future plant; and that when the seed first germinates, the enlarged lobes are the earliest part to appear above ground as leaves, differing from the *true* leaves, which appear on the developed germ. These *seed* or *nurse* leaves are called *Cotyledons*; but the seeds of *A-cotyledons* (without seed-leaves) are simply a collection of cells; and these do not sprout or spring from one point, but gradually expand into a green film. Cell develops from cell; next stems and little leaves appear, so delicate that a touch will crush them; and this process continues month after month, so slowly and quietly that it will be revealed only by very close observation, until we see that the green films have changed into tiny plants, each bearing a seed-vessel of its own. Many mosses are of rapid growth, but others, in proportion to their size, are among the slowest of vegetable growers, and they are both annual and perennial in duration.

In the botanical system of Linnæus mosses were placed among the Cryptogamic plants. It is true that the various parts of their fruit are so small as only to be fully examined by the help of a microscope, but the flower and fruit as a whole may on most species be easily seen. Their true nature has only been recently understood; and it is now ascertained that mosses have real flowers, differing indeed from the flowers of other tribes of plants, but having parts which answer to those of larger and more showy blossoms. For a detailed account of these the reader is referred to the scientific description; it is enough here to say that the flowers are of two kinds, male and female, the two kinds often on different plants, more seldom on the same, and still more rarely on the same part of the same plant. The male blossom, whose contents correspond to stamens, is sometimes cup or properly cactus shaped, and it is conspicuous on the various species of *Polytrichum*, or hair-moss; in this instance its brilliant orange and crimson cups being very like ordinary flowers. The female blossom, enveloped in the sheath (or *perichætum*), has a body answering to the pistil, and this in time will produce the seed-vessel, the parts of which are the stalk (*seta*) supporting the seed-vessel itself (*capsule*). This, in its early stages, is covered with an extinguisher-shaped veil (*calyptra*), which is generally like a thin semi-transparent membrane; but in the *Polytrichum* (hair-moss) family is clothed with silky golden filaments, and in the *Orthotrichum* (bristle-moss) tribe is beset with upright hairs. As the contents of the capsule become larger it expands, and in most cases the calyptra, becoming split and torn, then falls off, but in a few mosses it is permanent. The division of the calyptra may take place at the side, or all round it, or it may be irregular; but so perfect is the "order of the universe," even in things so minute and apparently unimportant, that the calyptra always splits in the same manner on the same species of moss. The veil gone, the capsule is revealed, its most common form being that of a bird's head, but it is often round, as in the *Bartramia* (apple-moss) group, and urn-shaped, as in the hair-mosses. The mouth is generally closed by a lid (*operculum*), which has often a beak, and when the seed is fully ripe the lid generally falls off, and it is scattered. Sometimes, however, the capsule has no removable lid, and the seed then escapes through the bursting of its sides. The lid gone, we generally find the mouth of the capsule still farther guarded by a single or double row of hairs; these are the fringe (*peristome*). When the fringe is present it takes a variety of forms; but in

the number of teeth of which it is composed is exact order. Each genus has its own, and it always is one which can be divided by four; four, eight, sixteen, thirty-two, sixty-four; the intermediate numbers are never found. The teeth are sometimes double, sometimes forked, often beautifully marked and furrowed, and at other times connected by little transverse bars. The *Tortula*, or screw-mosses, derive their name from the fact of their peristome being twisted like the top of a shell; the *Dicranum*, or fork mosses, from their teeth being forked; the *Zygodon*, or yoke-mosses, are so called because the teeth are yoke-shaped; and the *Didymodon*, or twin-toothed mosses, have their teeth in pairs. The peristome is often yellow or brilliant red; its office is to protect the seed from too much damp, which, before it is fully ripe, would injure it; and it is therefore extremely sensitive to moisture, opening in dry weather and closing in wet. Some of the *Hypnum*s, or feather-mosses, have very large capsules, and if they are gathered before the seed is quite matured the lid will easily come off, and the bright outer fringe of yellow teeth will immediately spread out like rays, but as quickly close again on feeling even the slight moisture of the breath. And this may be observed with the naked eye.

Hitherto we have spoken of the outside of the seed-vessel. The interior contains the column (*columella*), to which are attached the bags (spore-cases) containing the seed (*spores*). In the hair-mosses the top of the column spreads out like a table, and the points of the fringe are united to it. (See Illustration of the different parts of fructification).

Collectors will at first be puzzled when they discover that some mosses are never found in fruit. The reason of this is that all the mosses of one species in a particular locality may have flowers of one kind only, when the male and female are situated upon different plants; and therefore the fructification can never come to maturity. The moss may even be wholly barren. The *Orthotrichum phyllanthum*, or frizzled bristle-moss, is found in nearly all parts of the world; more than fifteen thousand feet above the sea-level, "on the highest point of vegetation on Chimborazo," also at Cape Horn, and in England, and it has never been seen in fruit, but is propagated by buds (*gemmæ*), formed at the ends of the leaves. Of these things the reasons are hidden from us, just as is the manner in which the different parts of the moss flowers act upon one another at all, so as to produce *any* seed. We can but say, "It has pleased God that it should be so;" though we may

conjecture that the frequent barrenness of mosses is intended to be a check upon their otherwise too great increase ; and, as such, a merciful provision for ourselves. For their extreme hardiness of constitution, their combined sensitiveness to atmospheric influence and insensibility to blight, the small nourishment they require, and the multiplicity of their seeds when these are produced, are the causes of their universal distribution ; a moss thriving anywhere. But just as they bless and beautify and clothe the waste places of the earth, the growth of mosses over cultivated lands would be in the highest degree injurious. There is, therefore, probably in this way restraint put upon their increase. Intended and fitted to fill their own place in creation, the very causes for which they thrive on the barren land might make them too ready to overspread also the tilled soil, and they therefore are bidden to stop ; but some idea of the care taken that they *shall* fill and keep this place we may derive from the consideration that all the variations of form, number, colour, condition when dry, even to the twisting of the fruit-stalk, constitute real and abiding differences between one species of moss and another ; the leaf, so minute that it can hardly by the eye alone be seen, is guided in its waving by the Hand which metes out the heavens ; the moisture needful for its nourishment is taken account of in the measuring of the waters ; the atom of green dust is directed to the speck of earth best fitted for its growth, by Him who led and clothed and fed His people Israel for forty years through the wilderness.




SECTION IV.

MODE OF COLLECTING AND EXAMINING MOSSES.

Glasses he had, that little things display,
 The beetle, panoplied in gems and gold,
 A mailèd angel on a battle-day;
 The mysteries that cups of flowers enfold,
 And all the gorgeous sights which
 Fairies do behold.

WORDSWORTH.

O real advance in the knowledge of mosses will ever be made until they are collected and examined, and a few homely hints upon the best way of doing these things may not be out of place. The study is emphatically a winter pursuit. Winter days, without a doubt, often hang very heavily. All the neighbours are too far off to visit or to be visited in short light and rough weather, new books do not come in fast, and as dulness feeds upon itself, those we do get we do not care to read. Stories about winter we have in abundance, but they mock us with descriptions of clear blue skies and frosty air; and at this present time *our* sky is grey, our air damp, for it rained yesterday, and it will probably rain again to-morrow. There is little for it but to think how soon the shortest day will be here, and that “really this is a very dreary place in the winter.”

Truly an unpleasant state of things. And perhaps, kind reader, if you open this book on a winter day you may hail gladly some measure of relief; and find it you will in beginning the study of mosses. Something which can be carried on in winter, and, in fact, is best done at that time of the year, which in the course of one fine day will bring occupation in the house for many wet ones, and has the excitement of a pursuit and the novelty of a fresh hunting ground, is not without its advantages; and all these conditions are fulfilled in the study of mosses; so you had better be a moss-trooper.

We must, however, premise that nobody need think of becoming one who at all minds taking long and dirty walks, or is afraid of wet feet, or dreads doing that dreadful deed which is called by nurses "making yourself a figure." But supposing that you do not fear any of these things, you should choose for your moss-trooping a day after rain; dress so as to leave the arms free, avoiding long cloaks, shawls, and veils, everything, in short, likely to *catch* in the bushes, under which you will have to grope, and wear very thick boots or goloshes. Half the pleasure of a search is destroyed by the fear of an accident to one's dress, or of not being shod well enough to venture into the mire, for perhaps under those bushes you may find a prize, and you will never be satisfied that there was *not* one on the other side of the mud. You will need a strong knife with a broad blade, and two baskets, a large one, and a smaller to go into it; nothing more for the walk, for the mosses will keep fresh, and detailed examinations are better carried on in the house. For a long time the rule to be observed in collecting is simply to carry home all mosses that you find; it is a habit which will of itself be laid aside as you become familiar with them. Take large tufts, pulling them fearlessly, and removing with your knife such mosses as grow on trees, stones and earth; put the smaller kinds by themselves in the little basket, remembering the celebrated philosopher who made a great hole in the door for the cat and a little hole for the kitten. Do not miss those in fruit; but if you find a new moss which is barren, gather it nevertheless.

It will be well to guard a beginner against confounding any other tribe of cryptogamic plants with mosses. The leather-like tufts, and the grey, orange, and sea-green scaly or leafy growth upon trees and stones, are lichens, whose fruit is in little round shields or warts. Plants having branches like flat strings of transparent green or whitish scales, which are often seen growing among mosses, are *jungermannia* or liverworts. These in fruit seem as if they were stuck full of pins having black heads and transparent wires. Club-mosses are in reality more nearly allied to ferns than to mosses. They are rambling plants, much like cats'-tails fastened together by their ends, and grow in heathy places; their seeds being in brown cases collected in a club-shaped mass. A little practice will soon teach what are the true mosses, and when a moss is in fruit it will be known at once.

Having gone as far as you feel inclined, take your treasures home. They will

lie quietly in the basket until the next day. Now give yourself a couple of hours for looking over those you have brought in. Have an old thick book ready, which you do not mind spoiling, for drying your specimens, a couple of soup-plates full of water, and a cloth. Your first step will be to arrange your tufts. Spread plenty of newspapers on the table to catch the litter, of which there will be an abundance, and on these group your mosses according to whatever classification you please. Look at the position of the fruit, whether at the end of the branch or the side, the form of the stem, whether branched or not, the situation of the leaves, whether they are all round the stem or flat on each side of it; in short, whatever marks are given as the characteristics of an order. And it is best to be content with this for the first two or three days; as with trying to learn too much *at first*, you will only get confused and bewildered.

You will now carefully separate the little plants of which each tuft is composed; place these one by one in the first soup-plate to get a thorough washing, transfer them to the second, keeping the same plate for the last bath, as you will find the water get thick and full of *bits* of all kinds; take each piece up separately, dab off the *dripping* wet with the cloth, and lay it out between the leaves of your book. Do not mind *those* getting wet, but take care that your mosses do not touch each other. When a leaf is full, put three or four between it and the next you place any moss upon; and so continue until you have kept as many as you like. Your *débris* will consist of about half the quantity of moss you brought in, partly because when you gathered it you fancied, as all collectors do, that every piece you saw was finer than the last. But should you not be able to devote this time to arrangement, you may spread your mosses out anywhere upon newspapers, and let them remain so for a few hours; then wrapping them up in the same papers as tightly as you please, you may put them away in a drawer, or pack them up and keep them in parcels for months; and all they will need when at last you can sort them is, first, a good sprinkling from a watering-pot, and, when the heap is freshened, the baths in the soup-plates before advised, these baths being rather longer than if the mosses were freshly gathered.

The mosses may be left between the leaves for a month, and you will then require some permanent arrangement of the specimens. They may be gummed on paper and their names written underneath, and for this purpose gum-dragon (or tragacanth), which leaves no shining mark when dry, is the best. Many

when gummed must be placed immediately under a heavy weight to press them again, as the moisture of the gum will revive them. Or they may be folded neatly in paper, and their names should in this case be written outside; the locality should be given also, which is a point of some importance. For example, we know a spot in which *Mnium undulatum* is found abundantly in fruit; and two miles off is found the same moss with male blossoms. For years we knew of *Bryum roseum* growing in two or three places, very large and plentifully, but always barren; coming accidentally upon a fresh bit of ground, we discovered the moss there, and, to our delight, with the male flowers.

Having collected mosses for two or three days, you will be prepared for the distinctions of the species, for which the aid of the microscope must be called in. A Stanhope lens, or a botanical glass, will be very useful in the earlier examinations; but a microscope is necessary for the minute parts, and with this any one may now be provided at the cost of a few pounds. It is, nevertheless, far better in the first stages of the study to have no microscope at all, and to become thoroughly acquainted with "the aspects of mosses," solely by the eye, or by the help of the lens for the minuter ones. A familiarity with their forms will thus be gained obtainable in no other way, and the want of the microscope will teach for what it is really required better than anything else can do, and *double* the enjoyment of it when at last it is possessed. There would be far more eager pursuit of science if scientific helps and appliances were a hundred times or a thousand times less plentiful than they now are, for people seem to think that by getting a great many books on any topic they can with little trouble attain to a vast amount of knowledge of it. But "he who would rise to the highest place must ascend by steps, and not by jumps."¹

For microscopic examination the moss should be damp enough to keep it fresh, and how damp this is varies with different mosses. The leaves and sections can be afterwards mounted as microscopic objects, but the student should have the plants fresh. It will be impossible to see the whole of the plant at a time; but in order that you may have as much under examination as you can, it is best to begin with the lowest power that your instrument has. Put a moss flat between two slips of glass, place it under the microscope and look at its leaves, the shape of their

¹ Letter of Gregory the Great to Augustine, quoted in Stanley's "Memorials of Canterbury."

cells, whether the leaves are nerved or their edges are serrated, how far the serratures extend, the point of the leaf, &c. Next observe how the leaves are set, examine the leaves forming the perichætum, and observe whether the seta is twisted, and if there be any swelling near the base of the capsule; look if the capsule is furrowed, take off the operculum and notice the fringe, if single or double, the form of the teeth, the structure of the inner peristome, in short, every distinctive particular possible, and if you like to do so note them all down. Do this without troubling your head at all about the names of the mosses, but merely familiarize yourself for the present with the differences between each, for you will find one of your greatest stumbling-blocks to be a fancy that so many mosses are alike which in reality are essentially different; and great will be your surprise at the length of time it takes you to overcome this.

So, learning all that the lower power reveals, you will next make sections of the moss for study under the higher, for which you will require a curved knife, a pair of microscopic scissors with slanting blades, and a few needles fixed in corks. Remove the upper glass, but keep the moss flat; detach as many leaves as you like with the point of the knife and lay them on a slide, covering them at once with thin glass, lest they curl up; take one cut through the stem just below the junction of a leaf and another above it, and picking this section up with your needle, turn it about under the glass every way to see the manner in which the leaf meets the stem; to make a section of the leaf, hold it fast on the slide with a cork and cut one across with your knife; take this on the needle, having the *cut* edge, not the edge of the leaf, upwards for examination, as you must observe whether the margin is thickened or whether it is turned back. Examine the operculum, and dissect the capsule. The peristome will probably be covered with the spore-cases escaped from the interior; slip your knife *under* the outer peristome and gently remove it, to see the structure of the inner if it is present, and finally slit open the capsule with the point of the knife, whose curve you will now find very useful. The spore-cases will be scattered in abundance on the glass like silkworms' eggs, and these must also be noticed. The earlier and later stages of the unripe capsules may be examined by slices of them cut length-wise and cross-wise, and the male flowers should be dissected. In all this much more will be spoilt than is used, but practice will give the required nicety of hand, though some people will invariably be found more ready at it than others. Tedious work there must always be in whatever is

thoroughly done, and there will be times when even the most ardent spirits flag, and the most keen interest tires; the very use of the *might* of the hand brings the need of the *rest* of the labouring man, and work will be work, and play will be play, until the end of this working world. We cannot if we would change one into another, but love of the study will carry any one over the rough ground and through the tedious work which would make those without it turn aside and falter.

A very interesting mode of studying mosses is by their cultivation, which may, on a humble scale, be practised as follows. Take a garden-saucer, or a seed-pan, fill it about half-way with small rough stones, making the bed highest in the middle, have ready as many tufts of moss as will cover the surface of the stones, and arrange them according to taste, keeping the small compact mosses for the outside, but letting none stray over the edge of the saucer, or the moisture will drip from them. A group of the high tree-like mosses may be in the centre, and the intervening space can be filled with different feather-mosses. Be sure that the saucer is packed well, or the tufts will come to pieces; indeed it is better that they should a little overlap each other, and then no raw edges will be seen. If the saucer is a large one, place it on a board or tray, if small, on a plate; give it a thorough watering, and cover it with a bell-glass, which should be of sufficient size to come down upon the stand. Let it remain in a shady part of the room, the heat keeping up evaporation, the moisture will be condensed by the glass, and thus a damp atmosphere will be formed, without which no amount of root-watering would keep the mosses fresh in the drying climate of a sitting-room. Thus for months together all manner of changes may be observed; the dying out of old plants, the growth of the seed, the development of the fresh plants, and the springing up most probably of new species, whose seeds were brought in unwittingly. The properties of mosses may also be investigated; for instance, the lovely *Mnium undulatum*, by its own decomposition, speedily makes water foul in which it is placed, and if *Isothecium alopecurum* be put under a bell-glass in full sun-shine, and allowed to remain there, on removing the glass it will exhale the resinous smell of a pine tree in summer.

A moss-garden may be formed out of doors as easily as a fernery, by bringing together stones (or rocks if practicable) in a shady part of the grounds, and putting the tufts into canny holes and corners among them, or laying them about

upon the ground. At first, they should be kept well watered, but afterwards the mosses must be *let alone*, for they abhor to be meddled with, and will revenge themselves upon all busy-bodies by refusing to grow; nay, the more they are persuaded to thrive, the more pertinaciously will they decline to do it, as they entertain the usual aversion to "good advice." Only, when the mossery is in formation, let plenty of fresh *dead* leaves, of oak, beech, ash, and sycamore, be scattered about, fallen leaves producing the dampness of atmosphere which is essential to their well-being. They dislike evergreens in general, and laurels in particular, not growing among them even in mossy districts; but they do not object to the neighbourhood of the pine and fir tribe. The muscology of a district may be improved by these means, it being possible to bring together both kinds of plants of the dioicous mosses, which would then bear fruit; the spores of the rarer kinds might be scattered far and wide, and fresh mosses be naturalized, and the liking of mosses for special soils and situations¹ may be investigated as it has never been before. But the moss-garden, whether on the smaller or more extensive scale, may be left, with these directions, to the taste and skill of any who choose to follow them; and, in accordance with the practical spirit of the age, we now proceed to inquire, "Of what use are mosses?"

¹ In sub-alpine districts, for example, *Hypnum tamariscinum* and *Hypnum splendens* grow together. But in approaching the high lands the former gradually disappears, and the latter becomes finer and more abundant; until on the open hills large masses of *splendens* are found, and *tamariscinum* is only seen in sheltered nooks under the rocks.

SECTION V.

THE USE OF MOSSES.

Nothing is useless in creation. The tiniest insects, the smallest mosses, have their uses.

Rev. J. C. RYLE.



THE ends for which mosses are designed are precisely those which their structure is best calculated to fulfil. They need depth, thickness, and warmth; these are obtained by their multitude of stems crossing and recrossing each other; softness, gained by their infinity of little leaves; flexibility and toughness, which we find in their stems; power to make their way anywhere, which is given by the minuteness of their seeds; ability to maintain life, and hardihood of constitution, wherewith they are endowed through their cellular texture and atmospheric nourishment.

In the order of the universe we find that the use of mosses is primarily to other and more highly organized plants. They are spread at the roots of trees, and by their depth keep the warmth about them in winter, and the moisture in summer, which are necessary to their growth. But when they grow on their trunks and branches, mosses injure trees, by clogging their breathing pores. We next find that mosses are useful to the insect tribe, countless numbers of which find homes among their branches, and roam about in their shades as in mighty forests, and look with their thousand eyes upon the wonders of their gauzy leaves, and sun their wings of purple and of gold, and burnish their shining armour upon the polished columns of their urns. Over her nest the carder-bee constructs a dome of moss; and ascending higher yet, we find the bird's nest "built of wool and hay and moss." "Like loves like," and mosses and birds are formed to be together, for every mossy bank is full of mimic birds'-nests, with little brown heads peeping up from amid the feathers;¹ with moss the squirrel lines his nest,

¹ Nor is this the only instance of such affinity. The mouse-loving cat and the mouse-loving owl are alike from kittenhood and owlethod to old age. The sulphur-coloured butterfly, which revives to bear the earliest primrose company, is itself like a flying primrose. The blossom of the

and in its depths the dormouse curls himself round and sleeps the winter through.

But more important uses are fulfilled by mosses in forming soil for larger plants. A lichen is the first vegetable production to appear on the surface of a rock. By its decay this forms sufficient soil for the lodgment of the spores of a moss, and when in its turn the moss dies, the soil is deepened yet more, and prepared for the nourishment of other plants.¹ For man's direct needs mosses do but little. In former days they were used in medicine, but have long been laid aside. A pillow stuffed with hypnum was thought to procure sleep, hence its name from the Greek *ὑπνος*, sleep. When in Lapland, Linnæus used a pillow and matrass stuffed with polytrichum, finding it, when dry, easily rolled up, light and portable, and when required for use, only needing a wetting to make it soft and elastic. Lapland mothers line their children's cradles with moss, and a North American Indian mother fills a seal-skin bag with moss and other warm things, then putting her baby into it, draws it up round its neck, and so keeps it winter-proof. In the North of Europe the peasantry line their chimnies with the *Fontinalis antipyretica*, from an idea that it will not blaze. Air-plants grow well in sphagnum, and it is stuffed between the timbers of houses to deaden sound. Hugh Miller² found in the Highlands that sphagnum steeped in tar was still used for calking ships, a practice descending from the remotest antiquity.³ Brooms and brushes made of moss, probably polytrichum, are collected in the Industrial Museum at Kew, from Hawkhead in Windermere, Munich, Berne, and Jamaica, and they are also made in Cornwall. At Wallington in Northumberland, and in Yorkshire, moss is platted into hassocks. As moss never takes mildew, it is useful

meadow-sweet as closely resembles a flake of the foam of the brook it grows beside. Sea-shore plants have mostly sea-green leaves; while of the two characteristics of mountain vegetation, the pine-tree and the moss, one but repeats the form of the other, and the same thought is echoed in the tracery of the frost-work in the hollow of the mountain side. And have we not seen "snow-drops" hanging their heads above the snow?

¹ Under the highest powers of the microscope the seeds of a lichen only appear like fine dust, while with a power of 220 the spores of a moss appear of the size of silkworms' eggs. It is probably from the greater minuteness of its seeds, which would therefore more easily find lodgement, that the lichen grows first.

² My Schools and Schoolmasters.

³ My Schools and Schoolmasters.

for packing roots ; and the trunks of trees found undecayed in bogs and “ mosses,” which are large tracts almost composed of sphagnum, show its power of preserving from decay.

At the present time, there is a talk of using mosses in another way ; for it is said that mosses are “ coming into fashion,” by which is meant that they are to be used on all occasions for decorative purposes. Mosses are doubtless very beautiful, and it is equally beyond a question that there are many things which they would appropriately adorn. But in England we are too apt to think that because a thing is in itself pretty, we can make anything else pretty by fastening it on to it. This by no means follows. The beauty of a decoration depends upon the suitability of whatever is used for the purpose, to the particular object decorated. We should not weave a carpet of a cloud pattern. And a lady’s cap which we saw in a window was in no wise adorned by having sprays of artificial moss tacked all over it ; nor does it make a tea-service pretty that a spray of moss is painted upon every cup, the moss being no moss in particular, but a conventional idea of moss in general. Nor is a bunch of moss which has died of thirst suitable for trimming a bonnet. The chief beauty bonnets at present possess is their being fresh and clean ; dry moss is particularly fusty looking, and it is not improved by being dyed of a leather colour (! !), or a violent blue-green (! ! !), the latter being the worst, as being a bad match, for moss is *never* a blue-green. And the two-fold beauty of moss, in a single spray its exquisite delicacy and structure ; in a mass its colour, its intricacy, and its freshness, are entirely lost in the before-mentioned uses, while the very fine divisions and branchings make two or three sprays of moss together upon a bonnet, or anything to be seen at a short distance off, look *fuzzy*, and like rough hair.

But there is a legitimate use of mosses in decoration. Beautiful patterns may be gained from the forms of the cells, and a designer would have a new world opened to him by seeing them in a microscope, or by the plates in Bruch and Schimper’s “ *Bryologia Europæa*,” if he wishes to spare his eyes. The star-mosses will make borders, *Bryum roseum* or *Atrichum undulatum* seen *from above* as stars, patterns for carpets, the stars of their true green, the ground of the blue-black which is the colour of the shadow in moss. The feather-mosses would form rich scrolls, the various forms of capsules quaint corners and borders. Few mosses possess distinctive character enough for simple vignettes, but *Mnium*

undulatum, and one or two others, might be used in this way. Possibly the feather mosses in single sprays might be imitated in frosted silver, but by no means used in this way as borders for large dishes or massive salvers, rather as small personal ornaments.

To all decorations in real flowers moss forms the most beautiful and appropriate ground-work. A good feature in a "Dîner à la Russe" would be a plateau of moss, into which the dishes should fit, or from which they should rise; these, it is needless to say, of as simple form as possible, and having their edges in unbroken curves. The plateau may be made on the principle of a soup-plate, a couple of inches deep, and with a broad plain edging of glass or silver, and filled with moss, upon which might be arranged primroses, masses of gorse, roses, scarlet geraniums, or red rhododendrons and camellias, avoiding blue and lilac, which will not show by candlelight, and choosing rather crimson, scarlet, yellow, or white flowers. By this means may Birnam Wood be easily brought to Dunsinane. The winter gardens, now so much in vogue for drawing-room ornamentation, might be greatly improved by the use of moss. A portable flower-bed can be formed by planting from five to ten hyacinths in a seed-pan, and covering the surface of the earth with mosses arranged as we have before recommended for their cultivation. If the mosses are carefully placed, just as the green hyacinth-cone is expanding into a star, and sprinkled well when watered, they will keep fresh until the plants have finished flowering.

There are better and higher uses than these for mosses; and this introduction to their study having reached well-nigh its last page, we would dwell on them for a moment ere it is closed. It appears that in very many of His works the Creator of the world has in view the principal objects of making them fill up the measure of that "rejoicing" which we are told they cause Him; that they should bear their part in completing the "fulness of the earth," which is His; and that they should, by the fitness and contrivance manifested in their structure, and the beauty of their external fashioning, impress upon us how infinite must be the mind which can make every detail so perfect. We can, in a measure, comprehend why care and skill and wisdom of law should be brought to bear upon the balancing of a world or the regulation of a season,—we ourselves take trouble about things of much importance. But about things of no importance? Take a moss into your hand. Its kind might perish off the earth and none would miss it. Yet think what

guidance of its seed there must have been ; what ordering of weather, not a rain-drop too many or too few ; what skilful workmanship before it reached its perfection. Then you will say, "Thy way is past finding out." Think once more that the seed fell to the earth through the operation of the same law of gravitation which holds the planets in their courses, and you will know more of the "exceeding breadth" of His commandment, fitted alike for the greatest and for the least ; dwell for one instant on the care bestowed on the fringe of the moss, and you will believe of yourself, sharer of His own immortality, that the very hairs of your head are all numbered. And believing, as we do, that He rejoices or grieves over us in Heaven, we may surely say that when He reads the thoughts which the contemplation of His work brings, He will joy that thus it has fulfilled His purpose in its creation.

It is in winter, and in earth's most barren spots, that the moss flourishes best, and is most beautiful. May it not be a type of the countless *little* mercies which, in a time of bitter trial, are often sent us ? We might have been utterly overwhelmed, but there was *something* given us of which we say afterwards, "How thankful I was for that!" or, "It would have been so much worse if it had not been just then."

The seed of the moss may be wafted alike to the king's palace-wall or to the poor man's cottage-roof ; and thus the King of heaven and earth impresses all alike for His own service, and sets everywhere His sign-manual, and declares that by Him kings reign. Creeping over the gravestone, in the lapse of years it will have effaced the name of him who lies beneath, be he great or small. It will not stay to keep the title of the greatest in our sight, nor haste to hide the record of how the smallest was loved. There is a Record over which the moss shall never creep, and a Name which shall be confessed before God and the angels, and a building on whose walls the seed shall not rest ; be it our care to make these our own ; but these are of another world ; in this "God hath chosen the foolish things to confound the mighty, and base things, and things which are not, to bring to nought things which are, that no flesh should glory in His presence."

The mention of our last topic can, in a scientific book, hardly be out of place. In this age of doubt and question the whole foundation of our Christian faith is undergoing an examination more close and careful than it has ever before received, and the light of science is carried with a desire, on the one hand, there to discover

flaws and imperfections, and, on the other, to make manifest its strength and its immutability. And writing, as we believe we do, chiefly for the young, we would earnestly beg them to give no heed to the idea which, by well-meaning but ill-informed persons, is often expressed, that religion has anything to fear from the progress of scientific discovery. To say this is just to grant the opponents of our faith all that they claim, that God's Word and His works do in reality contradict one another. But true science is only the exposition of the laws by which God has governed the material world. A theory may be put forward with a confidence sufficient to make us suppose that its propounders "had been present at the creation, and knew exactly how everything took place," or others may impertinently say how they think God *ought* to regulate the world, instead of humbly seeking to know how He *has* regulated it; but these theories and fancies will ultimately be found as much opposed to true science as they are to true religion. Of their propounders, said one of the most learned men of his age and country, that, "Professing themselves to be wise, they became fools." And, among uninspired men, none in point of intellect stands higher than he who wrote for students the humble prayer:—

"This also we beg, that human things may not prejudice such as are Divine; neither that from the unlocking of the gates of sense, and the kindling of a greater natural light, anything of incredulity, or intellectual night, may arise in our minds towards Divine mysteries. But rather that by our mind, thoroughly cleansed and purged from fancy and vanities, and yet subject and perfectly given up to the Divine oracles, there may be given unto Faith the things that are Faith's."¹

¹ Bacon, "The Student's Prayer."





SCIENTIFIC CLASSIFICATION OF BRITISH MOSSES.

Order.

- | | | |
|------|--|------------------------------------|
| I. | Capsule splitting into four valves. | Generic Name.
<i>Andræaceæ.</i> |
| II. | Capsule round. Branches in clusters (fascicled.) Mosses without roots. | <i>Sphagnaceæ.</i> |
| III. | Capsule round or urn-shaped, with one opening. Branches straight or forked. Mosses rooted. | <i>Bryaceæ.</i> |

BRYACEÆ.

SECTION A. Fruit at the end of the branch. Stems straight or forked, leaves set round them, except in *Filicoidei*. Each plant with its own root. *Acrocarpi*.

Capsule without distinct Lid.

Sub-order.

- | | | |
|----|---|-----------------|
| i. | Capsule globular, bursting. Plants very minute. On earth. | <i>Phasceæ.</i> |
|----|---|-----------------|

Capsule with distinct Lid.

- | | | |
|-------|---|--|
| ii. | Capsule erect. Lid conical, with inclined beak. Leaves in eight rows. | <i>Weissieæ.</i> |
| iii. | Capsule oblong, drooping in many species. Peristome sixteen long forked teeth. | <i>Campylosteleæ.</i> |
| iv. | Capsule roundish-pear-shaped (pyriform), mouth wide, lid large, beak oblique. | <i>Seligerieæ.</i> |
| v. | Capsule long, erect or oblique. Lid with long curved beak. Peristome sixteen deep red forked teeth. Leaves set round the stem. (Fork Moss.) | <i>Dicranæ.</i>
(see <i>Filicoidei</i>). |
| vi. | Capsule elliptical, lid awl-shaped (subulate). Peristome sixteen divided teeth. Seta curved. | <i>Campylopodeæ.</i> |
| vii. | Capsule oval, erect. Lid convex, beak small. Leaves in five rows. | <i>Pottieæ.</i> |
| viii. | Capsule erect or drooping. Peristome of sixteen or thirty-two hair-like teeth, united at the base, twisted in Tortula. | <i>Trichostomeæ.</i> |

Sub-order.

Generic Name.

- ix. Capsule urn-shaped, buried in the leaves or on very short seta. Peristome twisted. Growing in water. *Ripariææ.*
- x. Capsule erect, seta long, lid conical, beak long. Calyptra entirely covering the capsule. (Extinguisher Moss.) *Encalyptææ.*
- xi. Capsule round, buried in the leaves or on very short seta. Peristome none. *Hedwigieæ.*
- xii. Capsule rounded. Lid with erect beak. Peristome single, sixteen teeth. Calyptra without furrows. Plants hoary. *Grimmieæ.*
- xiii. Capsule erect, without swelling at the base (apophysis). Lid conical, beaked. Calyptra furrowed, smooth. *Ptychomitrieæ.*
- xiv. Capsule long, hidden or on short seta. Peristome wanting, single or double; in the latter case the outer of thirty-two teeth, united so as to form eight broad ones. Calyptra large, with few furrows, generally covered with erect bristles. *Orthotricheæ.*
- xv. Capsule erect, pyriform, striated. Beak long. Calyptra small, smooth. Teeth of outer peristome united in pairs. *Zygodontææ.*
- xvi. Capsule erect. Calyptra in folds. (Plicate.) Peristome of four teeth united to the columella. *Tetraphideæ.*
- xvii. Capsule very large, flat above, round below. Lid small, columella large. Plant very small, the capsule the only conspicuous part. *Buxbaumieæ.*
- xviii. Capsule erect or oblique, urn-shaped. Lid beaked. Peristome of thirty-two to sixty-four teeth, united at the top by the summit of the columella. Calyptra hairy. (Hair Moss). *Polytricheæ.*
- xix. Capsule pyriform, generally drooping. Lid conical with short beak. Peristome, outer sixteen teeth, inner a membrane in sixteen divisions. *Bryeæ.*
- xx. Capsule pyriform, inclined. Peristome double. Fruit at the summit of the side branches. (Cladocarpous.) *Mielichhoferieæ.*
- xxi. Capsule pyriform, oblique. Peristome double; outer sixteen teeth, inner a membrane in sixteen divisions. Seta very long. *Meesieæ.*
- xxii. Capsule erect or oblique, pyriform. Lid convex. Calyptra very large and inflated. Seta twisted. (Cord Moss.) *Funarieæ.*
- xxiii. Capsule erect or drooping, round, generally furrowed when dry. Calyptra very small. Seta long. (Apple Moss). *Bartramieæ.*
- xxiv. Capsule drooping, of thick texture, furrowed, rounder above than below, mouth small, situated on the lower side. *Oreadeæ.*
- xxv. Capsule drooping, roundish, lid large, teeth of the single peristome divided from the middle to the base. Plants very minute, growing from a green film (thallus). *Disclieæ.*

Sub-order.

Generic Name.

- xxvi. Capsule erect, apophysis larger than upper part (sporangium). Seta very long. Growing on animal matter. -

Splachnææ.

Leaves flat on each side of the stem. (Complanate) Filicoidei.

- xxvii. Capsule erect, oval, lid convex, peristome none.
xxviii. Capsule erect or inclined. Lid beaked. Peristome of sixteen deep red teeth, divided three-fourths of their length, barred.

Schistostegææ.

Fissidentææ.

SECTION B. Fruit from the side of the moss. Branches often feather-like (pinnate).

Roots creeping. *Pleurocarpi.*

- xxix. Capsule erect, oval, apophysis very short. Lid convex. Beak long. Peristome none.
*xxx. Capsule erect, oval or long. Lid conical or beaked. Calyptra large. Seta short. Perichaetial leaves large.
*xxxi. Capsule erect, regularly formed. Lid conical or beaked. Calyptra large, seta long. Many species tree-like. (Dendroid.)
xxxii. Capsule curved, oblique. Lid with curved beak, calyptra small, seta long. Peristome double; the outer of sixteen teeth, the inner a membrane in sixteen divisions, with intermediate threads (cilia).
xxxiii. Capsule erect. Lid beaked. Peristome double. Leaves and branches complanate.
xxxiv. Capsule horizontal. Lid beaked. Peristome double. Seta long. Calyptra entire, or many divided at the base (mitriform).
xxxv. Capsule erect, oval; immersed in the perichaetium. Calyptra mitriform.
xxxvi. Capsule immersed in the perichaetium. Lid conical. Plants very large, floating in water.

Anæctangiææ.

Leucodontææ.

Isoeteciææ.

Hypnææ.

Omalieææ.

Hookeriææ.

Cryptothecææ.

Fontinalææ.

NOTE.—The above sub-orders are those adopted in Wilson's "Bryologia Britannica." In the "Bryologia Europæa" of Bruch and Schimper they are divided into many more, and even upon the generic names botanists are by no means agreed.

* Probably these two should be united.



THE
AMATEUR'S CLASSIFICATION OF MOSSES.

I. STEM STRAIGHT OR SPARINGLY FORKED, WITH LEAVES AROUND IT.

FRUIT AT THE SUMMIT. PLANTS ROOTED.

Star Moss

A. MICROSCOPIC MOSSES.

Genera.

a. Capsule a round green dot.

Archidium. Phascum.

b. Capsule, an urn on a fruitstalk.

Seligeria. Discelium. Anodus.

B. MOSSES DISTINGUISHABLE BY THE NAKED EYE.

a. Capsule erect or oblique.

i. Leaves small or narrow.

α. Stems none. Fruitstalk half buried.

Buxbaumia.

β. Stems very short. In patches upon earth and rocks.

1. Capsule hidden among the leaves.

Small and round.

Schistidium.

Large, and like a grain of wheat.

Diphyscium.

2. Capsule an urn on a stalk,—

Gymnostomum. Pottia. Physcomitrium. Weissia. Anacalypta. Didymodon.

Brachyodus. Trichostomum. Entosthodon. Brachyodus. Campylo-
telium. Desmatodon.

γ. Stems slender, half-inch to two inches long. In tufts on earth and rocks.

Capsule on short fruitstalk.

Stylostegium. Glyphomitrium.

Capsule on long fruitstalk, leaves small. On earth or rocks.

Gymnostomum. Dissodon. Trichostomum. Weissia. Didymodon. Tayloria.

Leaves long and silky. In bogs.

Paludella. Amblyodon.

Weissia. Rhabdoweissia. Cynodontium. Blindia. Arctoa. Dicranum.

Ceratodon. Distichium.

Genera.

- δ. Stems slender. Two to four inches long. In tufts. Leaves small.
 On rocks. *Andræa*.
 Leaves silky and long. On earth.
 Dicranum. Dicranodontium. Trichostomum. Campylopus.
 On decayed animal matter. *Tetraplodon*.
- ε. Stems in compact cushions.
 Capsule long, leaves bright green.
 Bryum. Trichostomum. Tortula. Dicranum. Didymodon.
 Leaves whitish-green. *Leucobryum*.
 Capsule round. *Catoscopium. Bartramia. Conostomum. Bartramidula*.
- ι. Leaves large in proportion to the plant.
- α. Stems short. Capsule on short fruitstalk. On earth or rocks.
 Ædipodium. Physcomitrium. Anacalypta.
 Capsule on very long fruitstalk. Calyptra smooth, or slightly
 hairy. On decayed animal matter. *Splachnum*.
 On earth. *Oligotrichum. Funaria.*
 Calyptra hairy. *Pogonatum*.
- β. Stems long. Capsule oblique, with a long beak. Calyptra smooth.
 Leaves transparent. *Atrichum*.
 Capsule erect, with a short beak. Calyptra hairy. Leaves
 opaque. *Pogonatum. Polytrichum*.
- γ. Capsule drooping, urn-shaped or oval. Stems short. Fruitstalk short. *Grimmia*.
 Fruitstalk long. *Orthodontium. Bryum. Leptobryum*.
 Stems long.
 Leaves large and few, spreading at the top. Stems smooth.
 Bryum. Mnium.
 Stems matted with roots. *Mnium. Cinclidium*.

II. STEM REPEATEDLY BRANCHED. LEAVES SET ROUND IT.

FRUIT AT END OF BRANCHES.

Candelabra Moss.

Genera.

- A. Leaves broad. Stems long. *Mielichhoferia.*
 B. Leaves small and narrow. Plants mostly sage-green, and like frayed worsted.
 α . Stems with forked branches. Capsule hidden among the leaves.
 Anæctangium. Grimmia. Hedwigium. Schistidium.
 Capsule round, and on very short fruitstalk. Calyptra smooth.
 Glyphomitrium. Ptychomitrium.
 Capsule oval or urn-shaped. Calyptra smooth.
 Tetraphis. Tetrodontium. Zygodon.
 Calyptra covered with erect bristles. *Orthotrichum.*
 Capsule on long fruitstalk. On rocks and earth. *Racomitrium. Dicranum.*
 In bogs. Stems smooth. *Meesia.*
 Stems matted with roots. *Aulacomnion.*
 β . Stem straight. Branches set round it. Capsule, a brown urn. Sage-green.
 Leaves hairy. On rocks. *Trichostomum.*
 Ragged and spongy. Colour washed out. In bogs. *Sphagnum.*

III. STEM BRANCHED AT THE SIDES. LEAVES SET FLAT OR ROUND THE

STEM. FRUIT PRINCIPALLY AT THE SIDE.

Feather Moss.

Genera.

- A. Leaves, broad and transparent, on each side of stem. Branches flat.
 α . Fruit terminal. Stems not branched. Capsule round. In caves. *Schistostega.*
 Capsule urn-shaped. In damp places. *Fissidens.*
 β . Fruit at the side. Stems sparingly branched. Leaves round. *Hookeria. Daltonia.*
 Leaves pointed and yew-like. *Fissidens.*
 Stems much branched. On trunks of trees. Leaves waved crossway. *Neckera.*
 Not waved. *Omalia.*

Genera.

B. Leaves small and pointed, set round the stem.

a. Capsule without fruitstalk. On trunks of trees.

Cryphæa.

In water.

Cinclidotus. Fontinalis.

b. Capsule on a fruitstalk. In dense mats. Leaves like scales. Side branches undivided.

Hypnum. Cyllindrothecium.

Side branches repeatedly forked.

Leptodon. Hypnum.

Leaves at an acute angle with the stem. Stems forked; or straight, with side branches undivided. Plants in mats.

Hypnum. Leucodon. Antitrichia. Anomodon. Leskea.

Stem straight, side branches divided.

Hypnum.

IV. STEMS ERECT, BRANCHED AT THE TOP. ROOTS CREEPING.

(True Trees.)

 α . Stems short. Branches few.*Pterogonium.* β . Stems two to six inches high. Branches many. Capsule on branches.

Leaves small.

Climacium. Isothecium. γ . Stems tall. Branches drooping. Capsules at the summit of the stem.

Leaves large.

Mnium.



BRITISH MOSSES.

PART II.

EXPLANATION OF THE PLATES.



IN the following plates the mosses of Great Britain are arranged in regular order. The first figure, relating to every tribe, gives its leading *generic* distinctions, more or less magnified. The various species are next represented, of their natural size, and are usually accompanied by a magnified leaf. And when the variety is of sufficient importance, a magnified leaf, or other distinguishing portion of it, is added to the figure of the species to which it belongs.

The student is referred to Table II. for a synopsis of the classification here adopted. It is substantially the same as that of Mr. Wilson's "*Bryologia Britannica*," the most profound and learned work which has appeared upon the subject of the Mosses of the British Islands. Any who desire to plunge yet deeper into the mysteries of Bryology, may do so by the aid of M.M. Bruch and Schimper, in their "*Bryologia Europæa*." The adoption of an uniform system of scientific nomenclature for mosses is very much to be desired; that now used is the nomenclature of the "*Bryologia Britannica*." The names we have in some cases attempted to popularize, as our desire is to create an interest in their bearers, and what interest *could* be excited in the "*Glaucous trichostomum*," or the "*Leafy buxbaumia*?"

PLATE I.

INFLORESCENCE OF MOSSES.

The parts of the flowers (or inflorescence) of mosses are as follows. We have added to them the names of the apparently corresponding parts of what are commonly called "flowers."

FIG. 1. MALE.

- | | |
|-----------------------------------|--------------------|
| (a). Antheridia— <i>anthers</i> | } <i>stamens</i> . |
| (b). Paraphyses— <i>filaments</i> | |

The Antheridia are composed of cells, each containing a Spermatozoid—*pollen*.
Antheridia and paraphyses are surrounded by the Perigonium—*petals*.

FIG. 2. FEMALE.

- | | |
|--------------------------------|-------------------|
| (a). Archegonia— <i>summit</i> | } <i>pistil</i> . |
| (b). Paraphyses— <i>style</i> | |

From the centre of the Archegonia to the base is a canal, terminating in a Vesicle—*germen*.

The whole is surrounded by leaves, forming the Perichæcium—*calyx*.

As the Vesicle contained in it enlarges, the Archegonia bursts.

Its upper portion becomes the Calyptra.

Its lower the Vaginula.

From the vaginula rises the Seta, at first like a green thread; but its upper part gradually enlarges into the Capsule, whose parts we have already explained.

The functions of these various parts, and their relation to one another, are at present involved in mystery. Many mosses bear both the male and the female flowers on the same receptacle. They are then termed *synoicous*. Others bear them on different parts of the same plant; these are called *monoicous*. Others again have the different flowers on distinct plants. These are *dioicous*. The position of the male and female flowers in many cases determines the species of the moss. The mouth of the Capsule is surrounded by the Peristome, which contains the Spores.



PLATE II.

ANDREÆACEÆ.

FIG. 1. GENERIC CHARACTER.

Fruit at the ends of the branches (*acrocarpous*); stems erect, slightly branched. Leaves in eight rows. Cells (*areolæ*) (*a*) very small. Flowers (*inflorescence*) monoicous or dioicous. Capsule (*b*) split into four valves, united at the top by the lid, which does not fall off (*persistent*). Calyptra divided on one side (*mitriform*), separated from the vaginula, not, as in other mosses, by the rising of the seta, but by the enlargement of the capsule.

From the division of the capsule, the *Andreæaceæ* are made into a separate order (*Schistocarpi*) by M. M. Bruch and Schimper.

I. *Leaves nerveless.*

FIG. 2. ANDREÆA ALPINA.

Alpine Brown Moss (a).

Colour. Dark reddish-brown.

Stems. One to three inches long; branches of equal height (*fastigate*).

Leaves (b). Overlapping each other in tile-fashion (*imbricated*); broad below, tapering suddenly to a point (*obovate-acuminate*), narrowed below the middle, glossy.

Flowers and Fruit. Dioicous (?). Capsule, without apparent stalk, (*sessile*).

Locality. Alpine rocks.

FIG. 3. ANDREÆA RUPESTRIS.

Rock Brown Moss (a).

Colour. Purple-brown.

Stems. Quarter-inch to half-inch long; branches equal (*fastigate*), tufted.

Leaves (b). Tiled (*imbricated*), egg-shaped (*ovate*), with a blunt point (*obtuse*), covered with round prominences (*papillose*).

Capsule. Very small; sometimes on short fruit-stalk.

Locality. Rocks in subalpine districts.

II. *Leaves nerved.*FIG. 4. *ANDREÆA ROTHII.**Black Mountain Moss (a).*

Colour. Brownish-black.

Stems. Half-inch long, branched. In loose tufts (*incoherent*).

Leaves (b). Long, narrow, and curved like a sickle, lying over each other on the stem (*falcato-secund*); awl-shaped at the end (*subulate*). Those of the perichæcium (*c*) twice the length of the others.

Capsule. Buried in the leaves (*immersed*).

Locality. On mountain rocks.

FIG. 5. *ANDREÆA NIVALIS.**Snow Moss (a).*

Colour. Greenish or reddish-brown; paler than the other species.

Stems. One to three inches long, sparingly branched.

Leaves (b). Sickle-like (*falcate*), imbricated loosely, running into a point at the end (*subulate*), much longer than in the other species; the perichæcial leaves the same, but turning round the stem (*convolute*).

Capsule. Almost immersed.

Locality. Rocks at the line of perpetual snow; on Ben Nevis and other mountains of Scotland.—Wilson's "Bryologia Britannica."

All the species of *Andreæa* bear fruit in the summer.



PLATE III.

SPHAGNACEÆ.

FIG. 1. GENERIC CHARACTER.

Fruit apparently on short lateral branches (*cladocarpous*). Roots none. Stems erect, branched, the branches in bunches round the stem (*fascicled*). Leaves set spirally on the stem, of singular texture, generally whitish-brown. Areolæ (*a*) long, waved, lined with spiral filaments, having small pores, the whole, under the microscope, having the appearance of exquisite lace-work. Monoicous or dioicous. Antheridia inserted singly among the leaves of the perigonia. Archegonia at first sessile, but the receptacle elongating, and thus separating the leaves of the perichætium, the fructification appears to be at the end of a branch. Leaves of perichætium sheathing. Capsule (*b*) black, globular, shining, without peristome, without fruitstalk (sessile); that which appears to be the fruitstalk being in reality the long vaginula. Lid concave, flattened. Spores small.

These mosses extend over larger spaces than any others with which we are yet acquainted. In moorland districts the bogs are filled with them for miles;* by their rapid growth they often choke up pools, and aid in the formation of peat. They may be known by their generally washed-out, ragged look. Their colours are chiefly dirty white, brown, dull lilac, crimson and green; but in some species the young plants form dense cushions of bright emerald green. The species are numerous; they will at first be found rather difficult to determine, but they are soon distinguished by practice, and all will furnish an almost endless variety of objects for the microscope, of which it is impossible to exaggerate the wonder and the beauty. The capsule, examined with a condenser under a power of twenty, is like a goblet carved in ebony, supported on a silver stem. The leaves, each species having its own distinctive form of cell, but all having cells of the same general shape, appear like lace which casts the productions of Honiton and Brussels into the shade. A branch may be examined with a

* They form the "Mosses" of northern districts, and from the associations connected with "Mosses" and "Moss Trooper," the *Sphagnum* might be called the Historical Moss.

power of twenty, a single leaf with one of 200; but it would be worth while to place a branch first under the lowest power of the instrument, and one by one to add the higher, in order that the marvellous intricacy of the cell-patterns may be gradually developed. Every additional power will reveal some fresh beauty.

I. *Leaves blunt (obtuse) or roundish; sometimes elliptical.*

FIG. 2. SPHAGNUM CYMBIFOLIUM.

Blunt-leaved Bog Moss. Rag Moss (a).

Colour. Whitish-brown, sometimes reddish or purplish.

Stems. Thick, from a few inches to a foot in length; branches thick, stout, in bunches (*fascicles*) of three to five. The cells of the branches (*utricles*) lined with spiral filaments.

Leaves (b). Roundish egg-shaped (*obovate*), with glands (*papillæ*) at the back of the apex.

Flowers and Fruit. Dioicous. Capsules large and globular.

Locality. Bogs. Abundant.

FIG. 3. SPHAGNUM COMPACTUM.

Neat Bog Moss (a).

Colour. Whitish-brown.

Stems. Often forked (*dichotomous*); branches very crowded, of equal length (*fastigate*), apparently covering the whole stem.

Leaves (b). Egg-shaped, with a blunt point (*ovate-subulate*).

Flowers and Fruit. Dioicous (?). Capsule globular, not rising much above the branches.

Locality. Bogs. Not common.

FIG. 4. SPHAGNUM MOLLUSCUM.

Least Bog Moss (a).

Colour. Very pale, yellowish-white.

Stems. Two to three inches long, branches two and three together, slightly turning back (*deflexed*), of about equal thickness to the end (*not attenuated*).

Leaves (b). Round egg-shaped (*roundish obovate*).



Flowers and Fruit. Dioicous. Capsule very small, on long stalk (*pedicle*) ; brown.
Locality. Bogs.

The most delicate-looking of the species.

FIG. 5. SPHAGNUM RUBELLUM.

Red Bog Moss (a).

Colour. Dull red.

Stems. Two to four inches long. Branches tapering to a point (*attenuated*), two and three together, turning back (*deflexed*).

Leaves (b). Small, roundish-ovate, very concave.

Flowers and Fruit. Dioicous. Capsule small. Very rare.

Locality. Bogs.

II. *Leaves pointed (acuminate), ovate, or ovate-lanceolate.*

FIG. 6. SPHAGNUM ACUTIFOLIUM.

Sharp-leaved Bog Moss (a).

Colour. Dirty brown ; shoots often tinged with red or lilac.

Stems. Three to twelve inches long. Branches three to five together, the lower one or two together, and deflexed.

Leaves (b). Pointed egg-shaped (*ovate-lanceolate*). Perichætal leaves small.

Flowers and Fruit. Monoicous. Capsule brownish-black. Very common.

Locality. Bogs and marshes ; with *S. cymbifolium* the most abundant of the species.

FIG. 7. SPHAGNUM FIMBRIATUM.

Fringed Bog Moss (a).

Colour. Whitish-green.

Stems. Very slender, branches slender, the upper three to five together, the lower one and two, and deflexed.

Leaves (b). Branch-leaves (*b*) ovate, lance-shaped, running to a point (*acuminate*), stem-leaves (*c*) very broad, fringed at the end (*fimbriated*). Perichætal leaves very large.

Flowers and Fruit. Monoicous. Capsule very large, black, only just appearing above the perichætium.

Locality. Bogs and marshes; not uncommon.

FIG. 8. SPHAGNUM CUSPIDATUM.

Horned Bog Moss (a).

Colour. Pale whitish-green.

Stems. From three inches to many feet in length. Branches two to five together, attenuated, all deflexed, the upper turn back again like horns.

Leaves (b). Lanceolate, the margin often turned back (*recurved*), when wet; when dry, the margin undulated.

Flowers and Fruit. Dioicous. Capsule on short pedicel, large and black.

Locality. Wet places.

Variety (c). *Sphagnum Plumosum*, Feathery Bog Moss. Whitish-green, branches and leaves very long, the whole plant feathery-looking. In water.

FIG. 9. SPHAGNUM RECURVUM.

Curved Bog Moss (a).

Colour. Whitish-green.

Stems. Three inches to one foot long. Branches four or five together, attenuated, deflexed, and again recurved.

Leaves (b). Ovate-acuminate.

Flowers and Fruit. Dioicous(?). Capsule brown; small.

Locality. In bogs.

FIG. 10. SPHAGNUM CONTORTUM.

Twisted Bog Moss (a).

Colour. Pale brown.

Stems. Three inches to one foot or more long, stiff, black. Branches not attenuated, very numerous, three to five together, deflexed and twisted every way.

Leaves (b). Large, ovate-lanceolate, concave, fimbriated. Cellules small; very beautiful.

Flowers and Fruit. Dioicous. Capsules oval.

Locality. Bogs and pools.

Variety. *S. obesum*, stout bog moss; stems very thick; branches thick; leaves large; growing in water.

FIG. 11. SPHAGNUM SQUARROSUM.

Spreading-leaved Bog Moss (a).

Colour. Whitish-brown.

Stems. Rigid; three inches to one foot or more long. Branches two to four together; fewer and more scattered than in *S. contortum*, attenuated, deflexed.

Leaves (b). Ovate, acuminate, acute, spreading (*squarrose*), recurved.

Flowers and Fruit. Monoicous. Capsule large. All the species of *Sphagnum* bear fruit in summer.



BRYACEÆ.

True Mosses.

1. ACROCARPI (SUMMIT-FRUITED).

PLATE IV.

PHASCEÆ.

FIG. 1, 2, 3. CHARACTERISTICS OF ORDER.

Plants, the most minute of British mosses, with roots, capsule (fig. 1, *a*; 2, *a*) round, without fruitstalk (*sessile*), or on a very short seta, splitting at the side; lid (true) none; seeds (*spores*, fig. 1, *b*; 2, *b*) very large; cells (*areolæ*, fig. 3) very large.

FIG. 1. ARCHIDIUM.

Generic Character.

Capsule (*a*) without any separate lid, splitting at the side, sessile, spores (*b*) very large, few, angular.

FIG. 1, *c*. ARCHIDIUM PHASCOIDES.*Clay Moss.*

Colour. Light Green.

Stems. Quarter of an inch in length, with long barren shoots (*innovations*) from below the capsule.

Leaves (*d*). Lanceolate, wide apart; nerve thick, running beyond the leaf, (*excurrent*).

Flowers and Fruit. Monoicous. Capsule globular, rather pointed at the top.

Calyptra very small.

Locality. On damp ground.

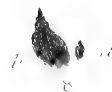
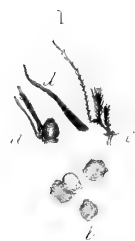


FIG. 2, 3. PHASCUM.

Generic Character.

Very minute. Capsule (fig. 2, *a.*) globular, splitting at the side, but with a trace, a *first thought* as it were, of a separate lid; generally with short fruitstalk. Spores (*b.*) large, smaller than in *Archidium*, round. Leaves in eight rows. Cellules (fig. 3) large and coarse-looking.

I. *Plants lasting a very short time. Capsule immersed.*1. Growing from a film (*thallus*).

FIG. 4. PHASCUM SERRATUM.

Serrated Earth Moss (a).

Colour. Light green.

Stems. Scarcely any; plants in large patches.

Leaves (b). Nearly (*sub*) erect, lanceolate, strongly serrated.

Flowers and Fruit. Monoicous. Capsule brown, nearly (*sub*) sessile. Spring.

Locality. Sandy banks and open places.

FIG. 5. PHASCUM COHERENS.

Clustered Earth Moss (a).

Colour. Dull green.

Stems. Hardly any.

Leaves (b). Ovate, lanceolate; nerved to the summit.

Flowers and Fruit. Monoicous(?). Capsule immersed, sub-sessile; pale brown.

Locality. On the ground. Hurst Pierpoint, Sussex. (Mr. Mitten, in "Bryologia Britannica.")

FIG. 6. PHASCUM SESSILE. v. β . STENOPHYLLUM.*Sessile-fruited Earth Moss (a).*

Colour. Dull green.

Stems. Scarcely any.

Leaves, (b). Awl-shaped (*subulate*), serrated; nerve running beyond the point (*excurrent*).

Flowers and Fruit. Monoicous. Capsule brown, sessile. Winter.

Locality. Clay or chalk; rare. Henfield Common, Sussex. (Mr. Mitten, in "Bryologia Britannica.")

FIG. 7. PHASCUM RECURVIFOLIUM.

Strap-leaved Earth Moss (a).

Colour. Dull green.

Stems. Hardly any.

Leaves (b). Strap-shaped, toothed; nerve strong, excurrent.

Flowers and Fruit. Monoicous. Capsule larger than in the last species; brown. Winter.

Locality. Heaths in various parts of England.

2. Plants without thallus, or sea-weed like (*confervoid*) shoots.

FIG. 8. PHASCUM MUTICUM.

Common Earth Moss (a).

Colour. Sage green.

Stems. Hardly any.

Leaves (b). Broad, ovate, acuminate, toothed at the apex; nerve strong and broad, growing over each other, and pressed together above the capsule, so that the plant is like a minute bulb, and of very stout texture.

Flowers and Fruit. Monoicous. Capsule immersed, erect, on a short seta. Autumn and Spring.

Locality. Moist earth. Common.

FIG. 9. PHASCUM TRIQUETRUM.

Triangular Earth Moss (a).

Colour. Dull green, changing to brown.

Stems. Almost none.

Leaves (b). Broadly ovate, shaped beneath like the keel of a ship (*keeled*), in three rows ; nerve strong, excurrent.

Flowers and Fruit. Monoicous. Capsule globular, seta bent at a right angle. March.

Locality. Cliffs on the coast of Sussex.

II. *Barren flowers in the junction of the leaf and stem (axillary).*

FIG. 10. PHASCUM FLOERKEANUM.

Floerk's Earth Moss. Brown Earth Moss (a).

Colour. Brown.

Stems. Hardly any.

Leaves (b). Crowded, ovate-acuminate ; nerve excurrent.

Flowers and Fruit. Monoicous. Capsule on short pedicel. Autumn.

Locality. Fields, on chalk or clay.

FIG. 11. PHASCUM RECTUM.

Upright Earth Moss (a).

Colour. Reddish brown.

Stems. Short.

Leaves. Crowded, elliptic lanceolate ; nerve excurrent.

Flowers and Fruit. Monoicous. Capsule on pedicel, having a trace of a lid. Winter.

Locality. Banks and fields. Common.

FIG. 12. PHASCUM TENERUM.

Tender Earth Moss (a).

Colour. Dull green.

Stems. Comparatively long.

Leaves (b). Lanceolate ; nerve excurrent.

Flowers and Fruit. Monoicous. Capsule immersed, on short pedicel. Winter.

Locality. Sussex. (Mr. Mitten.)

FIG. 13. PHASCUM CURVICOLLUM.

*Swan-necked Earth Moss (a).**Colour.* Dull green.*Stems.* Very short.*Leaves (b).* Broadly lanceolate, slightly recurved ; nerve excurrent.*Flowers and Fruit.* Monoicous. Capsule round, on curved pedicel. Winter.*Locality.* Moist banks and fields.III. *Barren flowers, like buds (gemmiform).*

FIG. 14. PHASCUM CUSPIDATUM.

*Horn-leaved Earth Moss (a).**Colour.* Green.*Stems.* Short.*Leaves (b).* Long, lanceolate, curved like a horn ; nerve strong, excurrent.*Flowers and Fruit.* Monoicous. Capsule on short pedicle, immersed. Spring.*Locality.* Sandy places. Common.

Very variable ; but the varieties are too minute to interest the general student.

FIG. 15. PHASCUM BRYOIDES.

*Moss-like Earth Moss (a).**Colour.* Dull green.*Stems.* Short, with and without branches (*simple*).*Leaves (b).* Ovate lanceolate, concave ; margin turned back (*reflexed*) ; nerve running to a bristly point.

Flowers and Fruit. Monoicous. Barren flowers sometimes at the end of a branch (*terminal*). Pedicel long. Capsule with short beak, turning to the right. Spring.

Locality. Banks and fields, in various parts of England ; but rare.

IV. *Barren flower in the axil of a perichætil leaf, or on a short branch at the base of the stem.*

FIG. 16. PHASCUM PATENS.

Spreading-leaved Earth Moss (a).

Colour. Green.

Stems. Short.

Leaves (b). Spreading, ovate-lanceolate, serrated; nerve ending below the point.

Flowers and Fruit. Monoicous. Capsule very small, immersed. Autumn.

Locality. On clay, and the dry beds of pools.

V. *Stems increasing in length by branches (innovations).*

Leaves very narrow.

FIG. 17. PHASCUM NITIDUM.

Delicate Earth Moss (a).

Colour. Green.

Stems. Short, simple, or branched.

Leaves. Hair-like (*linear lanceolate*); nerve ending below the point, which is slightly toothed.

Flowers and Fruit. Monoicous. Capsule elliptical; pale brown. Spring.

Locality. Moist places and dried pools.

FIG. 18. PHASCUM SUBULATUM.

Awl-leaved Earth Moss.

Colour. Emerald green.

Stems. Eighth of an inch long; simple or with innovations.

Leaves. Awl-shaped, long; nerve comparatively wide.

Flowers and Fruit. Monoicous. Capsule elliptical; brown, on very short seta, immersed. Calyptra mitriform. Spring.

Locality. Hedges. Common.

In Spring this moss appears on earthy places in hedges, like specks of brilliant emerald green.

FIG. 19. PHASCUM ALTERNIFOLIUM.

*Alternate-leaved Earth Moss (a).**Colour.* Greenish brown.*Stems.* Quarter to half inch long, often with innovations.*Leaves (b).* Subulate, very long, base dilated.*Flowers and Fruit.* Monoicous. Capsule immersed, on a short pedicel. Spring.*Locality.* On earthy places, not rare.

VI. *Stems more or less branched. Plants perennial. Leaves linear lanceolate. Capsule with traces of a divided (dehiscent) lid.*

FIG. 20. PHASCUM CRISPUM.

*Curly-leaved Earth Moss (a).**Colour.* Pale yellow-green.*Stems.* Short, branches equal (*fastigiate*).*Leaves (b).* Linear lanceolate; nerve excurrent.*Flowers and Fruit.* Monoicous. Capsule round, set obliquely; lid separating easily. Spring.*Locality.* Banks and fields.

FIG. 21. PHASCUM MULTICAPSULARE.

*Many-capsuled Earth Moss (a).**Colour.* Dull green.*Stems.* One-quarter to one-half inch long.*Leaves (b).* Lanceolate, margin flat (*plane*); nerve strong, excurrent. Crisped when dry.*Flowers and Fruit.* Monoicous. Capsule round. Beak half as long, oblique, sometimes two together. Spring.*Locality.* In fields. Rare.

FIG. 22. PHASCUM ROSTELLATUM.

*Beaked Earth Moss (a).**Colour.* Dull green.*Stems.* Very short, in tufts, simple or branched.*Leaves (b).* Linear lanceolate, obtuse, crisped when dry; nerve shortly excurrent.*Flowers and Fruit.* Monoicous. Capsule elliptical, brown, on a pedicel, erect.

Beak oblique. Autumn and Spring.

Locality. On dried beds of pools in various parts of England.

PLATE V.

WEISSIÆ.

FIGS. 1, 8, 15. CHARACTERISTICS OF SUB-ORDER.

Capsule (*a*) contracted at the mouth, lid (*b*) with a long beak, the beak slanting (*oblique*), leaves in eight rows. Areolæ small.

GYMNOSTOMUM.

FIGS. 1—7. BEARDLESS MOSS.

Generic Character (Fig. 1).

Capsule (*a*) roundish, of nearly the same shape on both sides (symmetrical), erect or slightly inclined, mouth contracted. No peristome; but in some species the spore case (*sporangium*) will adhere to the column when the capsule is ripe, and thus close the mouth. Lid (*b*) with an inclined beak, rising from a conical base. Leaves generally lanceolate. Plants perennial, minute, in tufts (*cæspitose*), on rocks or on earth.

I. *Dioicous.* Leaves scarcely crisped when dry, margin never incurved.

(*a*). Stems short. Capsule elliptic, mouth narrow.

FIG. 2. GYMNOSTOMUM TENUE.

Slender Beardless Moss (a).

Colour. Light green.

Stems. Very short, in patches.

Leaves (b). Sub-erect, tongue-shaped (*lingulate*), those of the perichætium larger, convolute.

Capsule. Red-brown, erect, elliptical. Ring round the mouth (*annulus*), remaining when the capsule is ripe (*persistent*). Summer.

Locality. On sandstone. Rare.

(b). Stems longer, branched. Capsule oval. Annulus persistent.

FIG. 3. GYMNSTOMUM RUPESTRE.

Rock Beardless Moss (a).

Colour. Bright green.

Stems. Half-inch long, branched, with roots from the junction of the branch and stem (*axil*).

Leaves (b). Much crowded, linear-lanceolate, obtuse; nerve ceasing below the point.

Capsule. Oval, thin of texture, brownish and polished; rather inclined. Autumn.

Locality. On wet rocks, in mountain districts.

FIG. 4. GYMNSTOMUM CURVIROSTRUM.

Curve-beaked Beardless Moss (a).

Colour. Grass green.

Stems. Half-inch long, branched, thickly covered with roots, plants closely tufted.

Leaves (b). Linear-lanceolate, acute, margins recurved, spreading.

Capsule. Ovate, large comparatively, lid with a long curved beak. Autumn.

Locality. Moist rocks in mountain districts.

II. *Monoicous. Leaves crisped when dry, their margins never recurved.*

(a). Capsule contracted at the mouth, sporangium united to the summit of the columella.

FIG. 5. GYMNSTOMUM SQUARROSUM.

Spreading-leaved Beardless Moss (a).

Colour. Yellow green.

Stems. Quarter of an inch or more long; in loose tufts.

Leaves (b). Spreading every way (*squarrose*), lanceolate; nerve excurrent.

Capsule. Ovate, lid beaked. Spring.

Locality. On earth, in fields, &c.



FIG. 6. GYMNOSTOMUM MICROSTOMUM.

*Small-mouthed Beardless Moss (a).**Colour.* Grass green.*Stems.* Very short, in thick tufts.*Leaves (b).* Lanceolate, crisped when dry, their margins incurved.*Capsule.* Variable, from oval to elliptical; olive brown; mouth very small.

Spring.

Locality. On earth in hedges and banks.(b). Capsule hardly contracted, sporangium *not* adhering to the columella.

FIG. 7. GYMNOSTOMUM TORTILE.

*Curly-leaved Beardless Moss (a).**Colour.* Reddish-brownish green.*Stems.* Thickly tufted, long, branches fastigiate.*Leaves (b).* Strong in texture, lanceolate, margins incurved; nerve red-brown, strong; leaves *very much* curled and crisped.*Capsule.* Largish, brown, ovate. Spring.*Locality.* On rocks. Rare.

WEISSIA.

WEISSIA (FIGS. 8-14).

FIG. 8. GENERIC CHARACTER.

Capsule (a) cylindrical or oblong-ovate; peristome single, of sixteen lanceolate teeth; lid (b) with an inclined beak; leaves in eight rows. Plants perennial, tufted; on earth.

- I. *Leaves lanceolate, acute, no distinct perichætium, teeth of peristome variable.*

FIG. 9. *WEISSIA CONTROVERSA.*

Controverted Moss (a).

Colour. Bright green.

Stems. Half-inch long, branched.

Leaves (b). Lanceolate, nerve strong, excurrent, margin curved *inwards*.

Capsule. Oblong-oval, nearly erect; seta twisted when dry. Spring.

Locality. On banks.

A new species of moss has been discovered by Mr. Wilson near Holyhead, between *Gymnostomum tortile* and *Weissia controversa*, and it is probable that the genera may in time be re-arranged.

FIG. 10. *WEISSIA DENSIFOLIA.*

Thick-leaved Weissia (a).

Colour. Bright green.

Stems. Half-inch long or more, often branched.

Leaves. Lanceolate, very thick, longer and stouter than in *controversa*; nerve strong, excurrent.

Capsule. Oblong, nearly erect, seta twisted, longer than in *controversa*. Spring.

Locality. Banks.

It is doubtful whether this moss is a variety of *controversa* or a distinct species. *W. Controversa* has many varieties, and it and the two last species of *Gymnostomum* are sometimes only distinguishable by the presence or absence of the peristome, which in the variety *W. Gymnostomoides* (naked-mouthed) is almost wanting.

FIG. 11. WEISSIA MUCRONATA.

Pointed-leaved Weissia (a).

Colour. Dull green.

Stems. Short, branched.

Leaves (b). Linear-lanceolate, very long and pointed; margins nearly flat; nerve prominent, excurrent.

Capsule. Ovate-oblong, striated, teeth of peristome short and very soon falling off (*fugacious*); seta twisted when dry. Spring.

Locality. On fallow ground.

II. *Leaves much crisped when dry, having a perichæcium, teeth of peristome longer. Monoicous.*

FIG. 12. WEISSIA CIRRHATA.

Bent-leaved Weissia (a).

Colour. Dark green.

Stems. Branched, loosely tufted.

Leaves (b). Linear-lanceolate, very much bent and spreading in various ways; the margin turned back (*reflexed*).

Capsule. Brown, contracted at the mouth, varying from oval to cylindrical. Spring.

Locality. On wood, also on rocks.

FIG. 13. WEISSIA CRISPULA.

Curly-leaved Weissia (a).

Colour. Dull green.

Stems. Long, branched, tufted.

Leaves. Between lance and awl shaped (*lanceolate-subulate*), base rather spreading, turned every way, margin flat (*plane*), nerve strong.

Capsule. Oblong-ovate. Spring and Summer.

Locality. Rocks in mountainous districts.

III. *Stems longer, leaves not crisped, peristome inclined to the right.*
Dioicous.

FIG. 14. WEISSIA VERTICILLATA.

Whorled Weissia (a).

Colour. Leaves sea-green (*glaucous*) ; capsule red-brown.

Stems. Half-inch long, branched, fastigiate.

Leaves (b). Linear-lanceolate, toothed (*denticulate*) at the base, erect, margin plane ; nerve strong and excurrent.

Capsule. Oval. Peristome inserted below the mouth of the capsule. Summer.

Locality. On wet rocks.

RHABDOWEISSIA.

STREAK MOSS (FIGS. 15-17).

FIG. 15. GENERIC CHARACTER.

Capsule (*a*) erect, oval, with eight longitudinal ribs (*striæ*) furrowed. Peristome single, teeth sixteen, red, much jointed. Annulus narrow. Lid (*b*) with an inclined beak. Leaves much crowded.

I. *Peristome soon falling (fugacious), teeth subulate.*

FIG. 16. RHABDOWEISSIA FRIGEA.

Minute Streak Moss (a).

Colour. Yellow green.

Stems. Half-inch long, tufted.

Leaves (b). Linear-lanceolate, acute, nerve strong, margins flat (*plane*).

Capsule. Roundish oval, beak long. Summer.

Locality. Damp crevices of rocks, &c.

FIG. 17. RHABDOWEISSIA DENTICULATA.

Tooth-leaved Streak Moss.

Colour. Dark yellow green, rather glossy.

Stems. Half-inch long, loosely tufted.

Leaves. Lanceolate or tongue-shaped (*lingulate*), toothed at the apex, nerve strong.

Capsule. Roundish, furrowed distinctly, with a swelling at the base (*apophysis*).
Summer.

Locality. Crevices of rocks.



PLATE VI.

CAMPYLOSTELEÆ (FIG. 1).

CHARACTERISTICS OF SUB-ORDER.

The characteristics of this sub-order are obscure. Mr. Wilson places in it the genus *Brachyodus*, but it appears to us that *Brachyodus* has more affinity with *Seligeria*, and we therefore only retain in *Campylosteleæ* the genus *Campylostelium*.

Capsule (*a*) oblong, its walls very thin, lid very long, awl-shaped (*subulate*). Seta very much bent (*geniculate*). Peristome single, of sixteen lanceolate teeth, connected at the base by a membrane; at the upper part forked unequally. Leaves (*c*) linear-lanceolate; cells (*areolæ*) very small at the apex, larger at the base. Monoicous. Plants minute.

FIG. 1. CAMPYLOSTELIUM SAXICOLA.

Bent Moss (c).

Colour. Dull green.

Stems. Very short, tufted, sometimes branched in threes.

Leaves (b). Lanceolate-subulate; the nerve sharp at the back (*keeled*), twisted.

Capsule. Oblong, lid long, seta bent. Winter.

Locality. On sandstone rocks; but rare.

The only known species. The bent seta may at first cause it to be mistaken for a species of *Campylopus*, with which also the calyptra and peristome have an affinity. It may ultimately be removed to that order.

SELIGERIEÆ (FIGS. 2-11).

CHARACTERISTICS OF SUB-ORDER.

Capsule nearly erect, roundish. Peristome wanting in some cases, when present single, of cloven teeth. Leaves lanceolate, nerved; plants small.

This sub-order again is involved in much obscurity. We have removed to it from *Dicranææ* the genera *Stylostegium* and *Blindia*.



BRACHYODUS (FIG. 2).

BRISTLE-LEAVED MOSS.

CHARACTERISTICS OF GENERA, (a).

Capsule erect, oblong, its walls thin, striated, and when dry furrowed. Annulus very broad, peristome very short, hardly rising above the annulus; single, of sixteen teeth. Calyptra three to five, lobed at the base. Leaves (b) bristle-like, the nerve forming the whole of their upper portion. Plants very minute.

BRACHYODUS TRICHODES.

Bristle-leaved Moss (a).

Colour. Yellow green.

Stems. Very short and slender, in patches.

Leaves (b). Lanceolate-subulate, almost round, the nerve forming their upper portion.

Capsule. Erect, oblong, when dry furrowed, striated. Spring.

Locality. On rocks in subalpine districts.

The only known British species, scarcely to be distinguished from *Seligeria*.

SELIGERIA.

BRISTLE MOSS (FIGS. 3-6).

FIG. 6 (a). GENERIC CHARACTER.

Capsule roundish pear-shaped (*pyriform*), seta curved or straight, lid large. No annulus (see *Brachyodus*). Peristome single, of sixteen teeth, lanceolate, obtuse, with rings (*articulate*). Leaves very narrow, the nerve almost forming their upper portion. Plants minute, *tufted* (see *Brachyodus*). Monoicous.

FIG. 3. SELIGERIA PUSILLA.

Smallest Bristle Moss.

Colour. Yellow green.

Stems. Scarcely any, not branched or forked (*simple*).

Leaves (b). Very narrow, subulate, scarcely more than a nerve.

Capsule. Minute, seta slightly curved. Spring.

Locality. On the sides of limestone rocks. Rare.

FIG. 4. SELIGERIA CALCAREA.

Chalk Bristle Moss.

Colour. Dull green.

Stems. Hardly any, simple.

Leaves (b). Lower part ovate, upper subulate (*ovate-subulate*), nerve thick.

Capsule. Larger than in *pusilla*, seta thicker. Spring.

Locality. On chalk.

FIG. 5. SELIGERIA CALCICOLA.

Little Chalk Moss.

Colour. Pale green.

Stems. Very short.

Leaves (b). Lanceolate, few.

Capsule. Roundish. Spring.

Locality. On chalk.

FIG. 6. SELIGERIA RECURVATA.

Curve-necked Bristle Moss (b).

Colour. Dull green.

Stems. Very short.

Leaves (c). Lanceolate-subulate, bent.

Capsule. Minute, on curved seta. Spring.

Locality. Sandstone rocks.

The following species have lately been discovered in England:—

Seligeria tristicha. Three-leaved Bristle Moss. Bright green, leaves lanceolate, not spreading at all, in three ranks, in other respects like *calcare*.

Seligeria diversifolia. Various-leaved Bristle Moss. Colour dull green, leaves linear-lanceolate, more numerous than in *calcicola*.

ANODUS.

FRINGELESS BRISTLE MOSS (FIG. 7).

GENERIC CHARACTER (*a*).

Capsule wide-mouthed. Peristome none. In all other respects this genus is like *Seligeria*.

ANODUS DONIANUS.

Mr. Don's Moss. Fringeless Bristle Moss.

Colour. Grass green.

Stems. Hardly any.

Leaves. Lanceolate-subulate, scarcely more than a nerve.

Capsule. Minute, erect, wide-mouthed. Spring.

Locality. Sandstone rocks. Rare.

One of the smallest of mosses.

STYLOSTEGIUM.

TUFTED BEARDLESS MOSS (FIG. 8).

GENERIC CHARACTER (*a*).

Capsule roundish-pyriform, seta very short, and capsule almost immersed. Peristome none. Annulus none. Lid large. Stems much branched, tufted. Leaves lanceolate, areolæ oblong. Monoicous.

STYLOSTEGIUM CÆSPITICUM.

Tufted Beardless Moss (b).

Colour. Brownish green.

Stems. One inch long, much branched, tufted.

Leaves (c). Much crowded, lanceolate, sickle-shaped (*falcate*), nerve strong.

Capsule. Almost immersed, ovate. July.

Locality. Crevices of rocks, on mountains.

No other species is known.

BLINDIA.

SILKY TUFTED MOSS (FIG. 9).

GENERIC CHARACTER (a).

Capsule roundish-pyriform, erect. Peristome single, of sixteen teeth, lanceolate, sometimes perforated, and sometimes cloven, red. Stems branched, tufted. Leaves lanceolate-subulate. Dioicous.

BLINDIA ACUTA.

Silky Tufted Moss.

Colour. Brownish green, very silky looking.

Stems. Half-inch to two or three inches long, branched, tufted, bare of leaves when old.

Leaves. Crowded, shining, lanceolate, subulate, nerve thick.

Capsule. Erect, on short seta, smooth, roundish pyriform. Spring.

Locality. Moist rocks on mountains.

DICRANEÆ.

FIG. 10, 11. FORK MOSSES.

For the characteristics of the sub-order see *Dicranum*, (Plate IX).

ARCTOA.

BROWN FORK MOSS.

FIG. 10. GENERIC CHARACTER.

Capsule erect, or inclined, furrowed and contracted below the mouth when dry. Peristome single, of sixteen lanceolate teeth, either cleft or entire, and perforated, deep red and remarkably sensitive to damp (*hygroscopic*). Stems tufted, branched. Leaves crowded, lanceolate, subulate, areolæ oblong. Monoicous.

ARTOCA FULBELLA.

Brown Fork Moss.

Colour. Brownish green.

Stems. Half-inch to two inches in length, branched, tufted.

Leaves (b). Crowded, falcate, not crisped, lanceolate-subulate; nerve strong.

Capsule. Ovate, eight-furrowed, lid oblique, peristome generally cleft, red.

Fruitstalk of various length. Summer.

Locality. Crevices of mountain rocks.

CYNODONTIUM.

PEAR-FRUITED FORK MOSS.

FIG. 14. GENERIC CHARACTER.

Capsule generally pyriform, and *oblique*. Calyptra large, lid beaked. Peristome single, of sixteen teeth, bright red, soon falling (*deciduous*), cloven to the base and the divisions joined by bars, or entire. Leaves lanceolate, very slightly toothed, twisted and curved. Monoicous.

FIG. 14. CYNODONTIUM BRUNTONI.

Pear-fruited Fork Moss (a).

Colour. Yellow and brownish green.

Stems. Half-inch or more long, branches fastigiate.

Leaves (b). Linear-lanceolate, keeled, twisted and curled.

Capsule. Pear-shaped, oblique; lid beaked, oblique. Spring.

Locality. Mountain rocks.

DICRANELLA.

This genus has only of late been discovered by Mr. Wilson, who places it between *Cynodontium* and *Dicranum*. Only one species is found in Britain, *Dicranella sinuosa*. Wave-leaved lesser Fork Moss.

Colour. Bright Green.

Stems. Half-inch long, densely tufted.

Leaves. Lanceolate, apex slightly toothed; nerve broad, reaching to the apex.

Capsule. With a swelling at the base (*strumose*). Peristome as in *Dicranum*.

Locality. Near Bangor. (Mr. Wilson.)

PLATES VII, VIII.

DICRANUM.

TRUE FORK MOSS.

Figs. 1, 2. Generic Character.

These mosses vary considerably in appearance, but they have all at the same time a great "family likeness," and the capsule placed under the microscope will at once reveal the most beautiful and singular peristome, deep red, forked, apparently carved and sculptured in lines and bars, and every tooth exquisitely incurved. The stems are of different lengths, the leaves of various forms, but all are long and narrow at the apex. Some of the larger species when not in fruit, form tufts of the brightest emerald green, almost the brightest indeed of any moss.

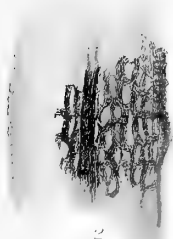
Capsules erect or curved and oblique, varying from oval to cylindrical, and sometimes apparently narrowing into the fruitstalk, occasionally strumose, *never round*. Calyptra very conspicuous from its long beak. Lid also with a long beak. Peristome (1) of sixteen forked and barred teeth, joined at the base, (*confluent*) incurved. Plants tufted, stems branched. Leaves various, areolæ (2) irregularly, four-sided (*quadrate*), becoming gradually larger towards the base of the leaf.

I. POLYCARPA.

Stems two inches long, tufted, fastigiate, rooted in every part of the stem. Leaves spreading, crisped when dry, nerve ceasing below the apex. Capsule striated.

FIG. 3. DICRANUM POLYCARPUM.

*Many-fruited Fork Moss.**Colour.* Yellow green.*Stems.* Long, fastigiate.





Leaves (b). Crowded, spreading every way, recurved; margin recurved, toothed at the apex.

Capsule. Erect or curved (*cernuous*) striated. Summer.

Locality. Alpine rocks.

Variety. *D. strumiferum* (c).

Colour blackish green. Leaves linear-lanceolate, serrated at the apex.

II. VIRENTIA.

Tufted (*cæspitose*). Stems covered with roots, forked; leaves spreading, nerve excurrent. Monoicous, capsule curved, with a swelling at the base (*strumose*).

FIG. 4. DICRANUM VIRENS.

Green Spur-fruited Fork Moss.

Colour. Yellow green.

Stems. Very long, forked; tufted.

Leaves (b). Spreading, sheathing at the base, very large; opaque, margin recurved.

Capsule. Curved underneath, (*cernuous*), strumose, lid beaked. June.

Locality. Moist alpine rocks.

III. SQUARROSA.

Stems forked, rooting in the lower part. Leaves lanceolate, wide; nerve not reaching to the apex. Dioicous. Capsule cernuous, not strumose.

FIG. 5. DICRANUM PELLUCIDUM.

Transparent Fork Moss (a).

Colour. Yellow green, *very light*.

Stems. Loosely tufted.

Leaves. Transparent, lanceolate, bent, obtuse, serrated at the apex, with glands (*papillose*) on both sides.

Capsule. Ovate, cernuous, lid beaked. Autumn.

Locality. In wet places, near spray.

Variety (c). *Fugimontanum*. Stems shorter, leaves shorter.

FIG. 6. DICRANUM SQUARROSUM.

Drooping-leaved Fork Moss (a).

Colour. Yellow green ; transparent.

Stems. Long, forked.

Leaves. Set out from the stem, and rather turned back (*squarrose*), lanceolate, base broad and sheathing ; nerve narrow, not reaching to the apex.

Capsule. Cernuous, beak short. Autumn.

Locality. Wet places in mountain districts.

IV. CRISPA.

Tufted. Stems short, rooting from the lower part. Leaves sheathing at the base, glossy. Monoicous or dioicous. Capsule cernuous.

FIG. 7. DICRANUM SCHREBERI.

Sheath-leaved Fork Moss (a).

Colour. Grass green.

Stems. Half-inch long, tufted.

Leaves (b). Upper part very narrow, suddenly spreading into a very broad base, crisped when dry ; nerve ceasing below the point, toothed near the apex.

Capsule. Ovate-cernuous. Lid large, beaked. Autumn.

Locality. On earth in wet places. Rare.

FIG. 8. DICRANUM GREVILLEANUM.

Greville's Fork Moss (a).

Colour. Yellow green.

Stems. Half-inch in length, slightly tufted.

Leaves (*b*). Narrow above, suddenly expanding into a sheathing base, entire; nerve broad and prominent.

Capsule. Cernuous, striated; lid long. Autumn.

Locality. In Glen Tilt. Dr. Greville. Common in mountainous regions in other parts of the world.

FIG. 9. DICRANUM CRISPUM.

Curl-leaved Fork Moss (*a*).

Colour. Grass green.

Stems. Quarter-inch long, in *patches* of separate plants. (*Gregarious*).

Leaves. Subulate, base sheathing, very much crisped and curled.

Capsule. Nearly erect, ovate, beak subulate. Autumn.

Locality. Moist banks. Not common.

V. RUFESCENTIA.

Stems short, gregarious. Leaves following each other at the same angle, (*secund*), lanceolate, opaque. Dioicous. Capsule nearly or quite erect, smooth; lid large; peristome very large.

FIG. 10. DICRANUM VARIUM.

Variable Fork Moss (*a*).

Colour. Grass green.

Stems. Very short, not much branched.

Leaves (*b*). Lanceolate, margin reflexed, nerve excurrent.

Capsule. Oval, oblique, lid large, beak short. Winter.

Locality. Common on moist banks.

FIG. 11. DICRANUM RUFESCENS.

Red Fork Moss (a).

Colour. Red brown.

Stems. Half-inch long, not much branched.

Leaves. Linear-lanceolate, margin plane ; very slightly toothed.

Capsule. Red, set straight on the seta, but the seta itself bent and twisted round ; ovate, lid conical. Winter.

Locality. Common on moist sandy banks.

VI. HETEROMALLA.

Stems half-inch to one inch long, cæspitose. Leaves secund, lanceolate, glossy. Dioicous. Capsule cernuous or nearly erect, striated, beak long.

FIG. 12. DICRANUM SUBULATUM.

Awl-leaved Fork Moss (a).

Colour. Grass green.

Stems. Half-inch long, in loose tufts.

Leaves. Secund, those at the base lanceolate, the upper lanceolate-subulate ; nerve prominent.

Capsule. Cernuous, ovate, beak long, seta red. Autumn.

Locality. Shady banks in mountainous regions in the north of England and Scotland.

DICRANUM CERVICULATUM.

Spur-necked Fork Moss.

Colour. Dark green.

Stems. Half-inch long, not much branched, tufted.

Leaves. Lanceolate-subulate, base broad and sheathing ; nerve broad and strong ; spreading.

Capsule. Roundish oval, strumose, furrowed when dry and empty ; beak long ; seta long and yellow. Summer.

Locality. Common on banks.

DICRANUM HETEROMALLUM.

*Silky-leaved Fork Moss.**Colour.* Dark green.*Stems.* Simple or branched, one inch long, in patches.*Leaves (b).* Crowded, lanceolate and rounded (*setaceous*), slightly toothed at the apex; nerve strong, curved and crisped, silky.*Capsule.* Nearly erect, or bent backwards, ovate, in *folds (plicate)* when dry.

Winter.

Locality. Banks. Common.

VII. FALCATA.

Stems densely tufted, branched, generally trailing (*decumbent*), at the base, not much rooted. Leaves sickle-shaped (*falcate*), secund. Capsule cernuous, strumose; beak long.

DICRANUM BLYTTII.

Dull Fork Moss (Plate X. Fig. 1 a).*Colour.* Dull green.*Stems.* Forked, tufted, very brittle, branches breaking short off.*Leaves.* Bent (*flexuose*) secund, base sheathing, upper part lanceolate subulate; nerve prominent.*Capsule.* Cernuous, with a struma, not striated. Summer.*Locality.* On mountain rocks.

FIG. 2. DICRANUM STARKII.

*Stark's Fork Moss (a).**Colour.* Yellow and brown green.*Stems.* One inch or more in length, branched, tufted.*Leaves (b.)* Falcate, secund, base lanceolate, upper part subulate and rounded (*setaceous*).

Capsule. Cernuous, oblong, strumose, striated. Summer and Autumn.

Locality. Alpine rocks.

A variety (*D. molle*), found on Ben Nevis, has very long stems and wide purple brown leaves.

FIG. 3. DICRANUM FALCATUM.

Sickle-leaved Fork Moss (a).

Colour. Yellow green.

Stems. One inch long or more, fastigiate.

Leaves (b). Base lanceolate, upper part lanceolate-subulate and denticulate ; nerve prominent.

Capsule. Ovate, strumose ; lid beaked.

Locality. Alpine rocks.

VIII. ORTHOCARPA.

In dense tufts. Stems long and forked, covered with root-like fibres. Leaves mostly pointing to one side of the stem, nerve excurrent. Capsule erect. Dioicous.

FIG. 4. DICRANUM CIRCINNATUM.

Curved-leaved Fork Moss (a).

Colour. Yellow green.

Stems. Long, branched.

Leaves. Base broad, upper part lanceolate-subulate, and toothed ; nerve prominent. Bent in a circular form (*circinnate*).

Found barren by Dr. Greville on Ben Voirlich.

FIG. 5. DICRANUM SCOTTIANUM.

Dr. Scott's Fork Moss (a).

Colour. Brownish-green.

Stems. One to two inches long, branched.

Leaves (b.) Much crowded, secund, lanceolate-subulate ; nerve prominent.

Capsule. Long, tapering at the base; peristome short, not much divided.
Summer.
Locality. Mountain rocks.

IX. SCOPARIA.

In large patches. Stems covered with fibres. Leaves long, secund or spreading, lanceolate-subulate. Dioicous. Capsule cernuous.

FIG. 6. DICRANUM FUSCESCENS.

Dusky Fork Moss (a).

Colour. Blackish green.
Stems. Long, branched.
Leaves (b). Secund, rather bent, crisped when dry, lanceolate-subulate, channelled (*canaliculate*); apex toothed; nerve excurrent.
Capsule. Oblong, cernuous; beak long. *Summer.*
Locality. Alpine rocks.

FIG. 7. DICRANUM SCOPARIUM.

Broom Fork Moss (a).

Colour. Yellow green.
Stems. Long, tufted, branched.
Leaves (b). Falcato-sekund, lanceolate-subulate, toothed at the apex; nerve in ridges at the back.
Capsule. Nearly erect, cylindrical, red-brown; peristome bright red; beak very long; calyptra large. *Summer.*
Locality. Very common in hedges, and on rocks in mountain districts.

FIG. 8. DICRANUM PALUSTRE.

Marsh Fork Moss (a).

Colour. Yellow green.
Stems. Long, fastigiate; in patches.

Leaves (b). Spreading, in a tuft at the end of the barren shoots, linear-lanceolate, glossy, and very much waved; nerve ceasing below the apex, which is toothed.

Capsule. Nearly erect, oblong, striated; beak very long; seta very long.

X. SPURIA.

Stems very long, tufted, covered with fibres. Leaves spreading, ovate-lanceolate. Capsule cernuous.

FIG. 9. DICRANUM SCHRADERI.

Broad-leaved Fork Moss (a).

Colour. Very yellow green.

Stems. Two to six inches long, branched.

Leaves (b). Ovate-lanceolate at the base, the apex lanceolate, obtuse; nerve prominent, ceasing below the apex, which is toothed.

Capsule. Oval-oblong, seta very long. Autumn.

Locality. In bogs. Rare.

FIG. 10. DICRANUM SPURIUM.

Rusty Fork Moss (a).

Colour. Yellow green; the stems rusty-looking with the matted fibres.

Stems. Two to three inches long, branched.

Leaves. Large, ovate-lanceolate, serrated; nerve ceasing below the apex.

Capsule. Cernuous, arched, striated. Summer.

Locality. On moors and in bogs. Fruit rare.

XI. PROCERA.

Very tall and large. Stems covered with whitish fibres, which are proliferous. Leaves large and glossy, base lanceolate, upper part linear-subulate. Perichaetium with more than one fruitstalk.

FIG. 11. DICRANUM MAJUS.

Great Fork Moss (a).

Colour. Grass green.

Stems. Four to seven inches long.

Leaves. Falcato-secund, very long, lanceolate-subulate, toothed from half way to the apex, waved across.

Capsule. Cernuous; when young brown, when old blackish, striated, seta very long. Summer.

Locality. Shady places.

The handsomest and largest of the species.

LEUCOBRYUM.

WHITE FORK MOSS (FIG. 12).

GENERIC CHARACTER.

Capsule and peristome much as in *Dicranum*. Stems branched. Leaves (*a*) the base with a thin border, the centre and upper part of two layers of cellules, quadrangular, like lattice-work (*b*).

LEUCOBRYUM GLAUCUM.

White Fork Moss (a).

Colour. White, deepening into sea-green, looking washed and faded.

Stems. Forked, in dense round cushions.

Leaves. Thick, very much crowded, lanceolate, obtuse.

Capsule. Red brown; sometimes two or three together; very rare.

Locality. Common on heaths and in woods.

CERATODON.

PURPLE FORK MOSS (FIGS. 13, 14).

GENERIC CHARACTER.

Capsule and peristome (*a*) much as in *Dicranum*; the latter when dry spirally incurved. Stems branched below the fertile flower. Leaves three to five rows; areolæ small.

FIG. 13. CERATODON PURPUREUS.

Purple Fork Moss (b).

Colour. Purplish.

Stems. Quarter-inch to three inches long, in patches, matted together, branched.

Leaves (c). Base erect, apex curved; oblong-lanceolate; margins recurved; nerve excurrent.

Capsule. Nearly erect, not quite regular; capsule and seta purplish; beak long, when dry angular. Spring.

Locality. Common everywhere on banks and walls.

FIG. 14. CERATODON CYLINDRICUS.

Narrow-fruited Fork Moss (a).

Colour. Yellow green.

Stems. Separate, in patches (*gregarious*), short.

Leaves. Base sheathing, upper part subulate; nerve strong, toothed.

Capsule. Small, nearly erect, curved, *smooth*; seta long and slender. April.

Locality. Sandy banks, not common.

PLATE IX.

CAMPYLOPODEÆ.

CHARACTERISTICS OF SUB-ORDER.

Capsule elliptic-oblong; lid between conical and awl-shaped; seta very much bent (*arcuate*). The form and curvature of the capsule and seta are precisely those of the head and neck of a swan, hence the generic name "Swan-neck Moss." (See *Campylostelium*.) Leaf-cells (*areolæ*) four-cornered (*quadrate*). (Fig. 2. c.)

DICRANODONTIUM.

GENERIC CHARACTER.

Capsule elliptic-oblong, *smooth*; calyptra entire, not fringed; annulus very small; teeth of peristome divided to the base, long and narrow, inserted below the mouth of the capsule.

FIG. 2. DICRANODONTIUM LONGIOSTRE.

Beaked Swan-neck Moss (a).

Colour. Grass green.

Stems. In patches, one to three inches long, the lower part covered with red root-fibres.

Leaves (b). Falcato-secund; base dilated and sheathing, upper part setaceous, strongly serrated, often falling off, crowded on the stems in bunches.

Capsule. Elliptic-oblong, smooth; seta arcuate. Barren in Britain. October.

Locality. Cromagloun, near Killarney. Dr. Taylor in "Bryologia Britannica."

The only species, in habit like a *Dicranum*.

CAMPYLOPODIUM.

GENERIC CHARACTER (FIG. 1).

Capsule (*a*) elliptic-oblong, often several together (*aggregate*), striated and furrowed; lid conico-subulate; annulus large; calyptra fringed at the base. Peristome (*b*) of sixteen deeply-cleft teeth, confluent at the base, barred. Stems dichotomously branched; leaves crowded in eight rows. Dioicous.

FIG. 3. CAMPYLOPUS DENSUS.

Thick-tufted Swan-neck Moss (a).

Colour. Yellow green.

Stems. In thick tufts; beset with root-fibres (*radicles*).

Leaves. Lanceolate-subulate, toothed at the summit; nerve broad; crowded.

Capsule. Brown, oval, very drooping. Winter.

Locality. On sandstone rocks, and woods in sandy soil.

FIG. 4. CAMPYLOPUS TORFACEUS.

Dwarf Swan-neck Moss (a).

Colour. Yellow green.

Stems. Tufted, branched; without radicles.

Leaves (b). Less crowded than in *densus*; base ovate-lanceolate, upper part setaceous; nerve narrow.

Capsule. Oval, on long curved seta. Winter.

Locality. Turf heaps in moors.

CAMPYLOPUS SETIFOLIUS.

Silky Swan-neck Moss.

Colour. Yellow green.

Stems. Long and slender.

Leaves. Spreading, few; base lanceolate.



Capsule. Unknown.

Locality. Carrig Mountain, Ireland. Dr. Taylor in "Bryologia Britannica."

FIG. 5. *CAMPYLOPUS FLEXUOSUS.*

Rusty Swan-neck Moss (a).

Colour. Yellow green.

Stems. Rather long, branched.

Leaves (b). Straight or falcate, lanceolate-subulate; nerve not very broad, smooth at the back.

Capsule. Very much drooping, elliptical. Winter.

Locality. Moist rocks, in mountain districts.

CAMPYLOPUS SCHIMPERII.

Schimper's Swan-neck Moss.

A new species, differing from *flexuosus* in the broad nerve, which is furrowed at the back. (Mr. Wilson's MS.)

FIG. 6. *CAMPYLOPUS POLYTRICHOIDEUS.*

Polytrichum-like Swan-neck Moss (a).

Colour. Brown green.

Stems. Long, stiff, branched.

Leaves. Ovate-lanceolate, erect, crowded; nerve very broad; rigid.

Capsule. Not known.

Locality. On moors. (Mr. Wilson's MS.)

FIG. 7. *CAMPYLOPUS BREVIPILUS.*

Short-leaved Swan-neck Moss (a).

Colour. Brown or black.

Stems. One to three inches long, branched, tufted.

Leaves (b). Lanceolate-acuminate; the upper with hair points; margins recurved.

Capsule. Barren in Britain.

Locality. Prestwick Carr, Northumberland.

FIG. 8. *CAMPYLOPUS LONGIPILUS.*

Long-leaved Swan-neck Moss (a).

Colour. Sooty green.

Stems. One to three inches long, in tufts, branched.

Leaves (b). Lanceolate-subulate, erect, point white, patent; nerve broad.

Capsule. Unknown.

Locality. Wet places among mountains, where it may at once be distinguished among all other mosses by its round thick tufts of a sooty green colour. It is the commonest of the species.



PLATE X.

POTTIÆ.

CHARACTERISTICS OF SUB-ORDER.

Plants minute, annual or biennial; tufted, on earth and walls. Capsule ovate, erect or slightly oblique. Monoicous, sometimes synoicous. Leaves nerved; areolæ (Fig. 1. *a*), oblong-quadrate.

POTTIA.

GENERIC CHARACTER (FIG. 1, *b*, *c*, *d*).

Capsule (*b*) ovate; peristome none; lid conical; beak oblique; columella (*c*) with a broad summit, which fills the mouth of the capsule. Spores (*d*) large. Perichæcium none.

FIG. 2. POTTIA CAVIFOLIA.

Oval-leaved Pottia (a).

Colour. Dull green.

Stems. Very short.

Leaves. Oval, bristle-pointed, with singular appendages like green bags, to the upper side of the nerve, (*lamellæ*), apparently masses of colouring matter.

Capsule. Ovate; seta short; lid oblique. Spring.

Locality. Earth.

Variety. *Pottia gracilis*, (Fig. 3, *a*), stems longer; leaves (*b*) looser (*lax*); capsule on long pedicel.

FIG. 4. POTTIA MINUTULA.

Smallest Pottia (a).

Colour. Dull green.

Stems. Extremely short.

Leaves. Oblong-lanceolate; margin recurved; nerve excurrent.

Capsule. Very small; lid large in proportion; beak short. Winter.

Locality. Fallow fields.

Variety. *Pottia conica* (Fig. 5, a). Leaves ovate-lanceolate; capsule narrower.

FIG. 6. *POTTIA TRUNCATA.*

Common Pottia (a).

Colour. Dull green.

Stems. Half-inch long.

Leaves (b). Oblong-lanceolate; margin reflexed; nerve sometimes excurrent, sometimes ceasing below the apex.

Capsule. Oblong, lid obliquely rostrate. Spring.

Locality. On earth in fields and banks.

FIG. 7. *POTTIA WILSONII.*

Oval-fruited Pottia (a).

Colour. Yellow green.

Stems. Very short; tufted.

Leaves (b). In eight rows, ovate-oblong; nerve excurrent.

Capsule. Elliptic-oblong, mouth contracted. Spring.

Locality. Sandy banks.

FIG. 8. *POTTIA CRINITA.*

Bristly Pottia (a).

Colour. Yellow green.

Stems. Short, thickly tufted.

Leaves. Ovate-oblong, obtuse, with a bristly point; nerve strong.

Capsule. Elliptic-oblong, hardly contracted; calyptra smooth. Spring.

Locality. Banks and earth on the sea-coast.

A variety of *P. crinita* (Fig. 9, a, b,) has longer stems, with larger leaves, a much shorter point.



FIG. 10. POTTIA HEIMII.

*Lance-leaved Pottia (a).**Colour.* Brownish green.*Stems.* Half-inch long, branched.*Leaves.* Lanceolate, serrated at the apex; nerve not excurrent; margin plane.*Capsule.* Oblong; plants polygamous. Spring.*Locality.* Banks near the sea.

ANACALYPTA.

GENERIC CHARACTER.

Resembling *Pottia*, but with a single peristome of sixteen teeth (Fig. 11), joined by a membrane at the base, lanceolate, entire or imperfectly cloven, sometimes perforated. Spores small.

FIG. 12. ANACALYPTA STARKEANA.

*Starke's Anacalypta (a).**Colour.* Yellow green.*Stems.* Extremely short; tufted; annual.*Leaves (b).* Oval-lanceolate, margin recurved.*Capsule.* Very minute, oval. Winter.*Locality.* Banks and earth.

FIG. 13. ANACALYPTA BRACHYODUS.

*Smallest Anacalypta (a).**Colour.* Yellow green.*Stems.* Scarcely any.*Leaves.* Lanceolate-acuminate; nerve broad.*Capsule.* Oval, seta short. Winter.*Locality.* Banks.

FIG. 14. ANACALYPTA CÆSPITOSA.

Round-fruited Anacalypta (a).

Colour. Dark green, tipped with lighter.

Stems. Very short, tufted.

Leaves. Oblong-lanceolate; margin flat, concave; nerve strong.

Capsule. Ovate; beak long. Spring.

Locality. On chalk hills.

FIG. 15. ANACALYPTA LANCEOLATA.

Lance-leaved Anacalypta (a).

Colour. Grass green.

Stems. Short, tufted.

Leaves (b). Lanceolate-ovate; nerve strong, excurrent; leaves large in proportion to the plant.

Capsule. Erect, oval-oblong, bright brown, shining. Spring.

Locality. Moist banks.

FIG. 16. ANACALYPTA LATIFOLIA.

Broad-leaved Anacalypta (a).

Colour. Yellow green, or silvery.

Stems. Like small bulbs; very short.

Leaves (b). Imbricated, widely ovate, glossy, concave.

Capsule. Oval-oblong, beak short. Spring.

Locality. In Scotland; but rare.

SUB-ORDER VIII.

TRICHOSTOMEÆ.

CHARACTERISTICS OF ORDER.

Stems generally forked, plants tufted, capsule oval or cylindrical, at the summit of the plant (*acrocarpous*). Peristome of sixteen teeth, usually barred transversely, very slender, and in *Tortula* twisted round.

PLATE XI.

TRICHOSTOMEÆ. PART I.

DESMATODON.

FIG. 1. GENERIC CHARACTER.

Leaves in eight rows, areolæ (*a*) large at the base. Capsule erect or drooping, teeth awl-shaped (*subulate*), united by a membrane at the base; forked (*bifid*), slightly twisting.

FIG. 2. DESMATODON NERVOSUS.

Ribbed-leaf Moss (a).

Colour. Yellow green.

Stems. Branched, in thick tufts.

Leaves (b). Oblong-oval, larger and spreading into a bunch at the summit, when dry twisted round the stem; their texture thick, the nerve remarkably strong, and thicker in the upper part.

Flowers and Fruit. Monoicous. Capsule oval, seta rather curved. Spring.

Locality. Banks and walls near the sea.

DISTICHIMUM.

(FIG. 3 *a*, *b*.) GENERIC CHARACTER.

Teeth (*Fig. 3 a*, *4 a*) at equal distances, inserted below the mouth of the capsule; lanceolate, much jointed (*articulate*). Leaves (*Fig. 3 b*.) inserted on opposite sides of the stem (*distichous*).

FIG. 3. DISTICHUM CAPILLACEUM.

*Fine-leaved Flat Moss (b).**Colour.* Emerald green.*Stems.* Branched, tufted.*Leaves (c).* In two rows, linear-lanceolate, wide apart.*Flowers and Fruit.* Monoicous. Capsule erect or slightly inclined, oval; teeth (*a*) linear-lanceolate. June or July.*Locality.* On mountains.

FIG. 4. DISTICHUM INCLINATUM.

*Oblique-fruited Flat Moss (b).**Colour.* Yellow green.*Stems.* In loose tufts.*Leaves (c).* Very narrow, more crowded than in the last species; in the perichætium three-ranked.*Flowers and Fruit.* Monoicous. Capsule oval, oblique; teeth (*d*) broader. Summer.*Locality.* On mountainous rocks. Rare. Ireland and Scotland.

DIDYMODON.

FIG. 5. GENERIC CHARACTER.

Stems branched, tufted. Capsule oval, erect; teeth in pairs, having no membrane at the base.

I. *Monoicous.*

FIG. 6. DIDYMODON RUBELLUS.

*Red Twin-toothed Moss (a).**Colour.* Dull green; setæ numerous, and very bright red.*Stems.* Tufted.



Leaves (b). Subulate; the upper dull green, the lower red.

Flowers and Fruit. Capsule brown, oval. Peristome soon falling (*fugacious*).

Antheridia in the axils of the perichaetial leaves, naked. Winter.

Locality. On rocks.

II. *Dioicous.*

FIG. 7. DIDYMODON LURIDUS.

Dark Twin-toothed Moss (a).

Colour. Dull green.

Stems. Branched, tufted

Leaves (b). Ovate-lanceolate, margin turned back (*reflexed*).

Capsule. Cylindrical. Winter.

Locality. On limestone walls. Rare.

FIG. 8. DIDYMODON CYLINDRICUS.

Slender-fruited Twin-toothed Moss (a).

Colour. Dark green.

Stems. In patches, branched.

Leaves (b). Linear-lanceolate, very much spreading.

Capsule. Of thin texture, cylindrical. Not common. Autumn.

Locality. Moist rocks.

FIG. 9. DIDYMODON FLEXIFOLIUS.

Bent-leaved Twin-toothed Moss (a).

Colour. Dark yellow green.

Stems. Slender, branched, in patches.

Leaves (b). Spreading, twisted and bent, very much so when dry; ligulate, serrated at the apex.

Capsule. Small; very rare. Spring.

Locality. On moors, particularly where the ground has been burnt.

FIG. 10. DIDYMODON GEMMACENS.

*Bud-bearing Twin-toothed Moss (a).**Colour.* Emerald green.*Stems.* Short, in patches.*Leaves (b).* Broadly lanceolate, serrated at the apex, with buds (*gemmae*) in their axils.*Capsule.* Cylindrical.*Locality.* Sussex. Mr. Mitten.

Mr. Wilson considers this a variety of *Flexifolius*, and that the following is the true *D. gemmacens*.

FIG. 11 (a).

Colour. Dark green.*Stems.* Slender, branched.*Leaves (b).* Broadly lanceolate; the nerve projecting beyond the apex.*Capsule.* Not known in Britain.*Locality.* (?)

FIG. 12. DIDYMODON RECURVIFOLIUS.

*Drooping-leaved Twin-toothed Moss (a).**Colour.* Dark green.*Stems.* Long and slender, fragile, branched.*Leaves (b).* Elliptic-oblong, becoming suddenly narrow above the middle, the upper part serrated, widely spreading and drooping; nerve excurrent.*Capsule.* Unknown.*Locality.* Found by Dr. Taylor on Knockavohila, a mountain near Killarney, Ireland.

PLATE XII.

TRICHOSTOMEÆ. PART II.

TRICHOSTOMUM.

FIG. 1. GENERIC CHARACTER.

Capsule oval or cylindrical; seta long and often slightly curved; lid beaked (*rostrate*) oblique; calyptra cradle-like (*cucullate*). Peristome (*a*) single, of thirty-two teeth in pairs, very slender, much articulated; connected by a membrane at the base, and much articulated; *slightly turning to the left*. Leaves lanceolate, or subulate, areolæ (*b*) larger at the base, and remarkably regular. Never on trees, but on the ground and rocks.

I. *Leaves lanceolate.*

FIG. 2. TRICHOSTOMUM CRISPULUM.

Curly-leaved Hair Moss (a).

Colour. Bright green.

Stems. Branched, in thick patches.

Leaves (b). Smaller below, upper crowded, linear-lanceolate; nerve rather projecting.

Flowers and Fruit. Dioicous. Seta curved, capsule cylindrical. Summer.

Locality. Limestone rocks near the sea.

FIG. 3. TRICHOSTOMUM MUTABILE.

Variable Hair Moss (a).

Colour. Bright green.

Stems. Branched, in patches.

Leaves (b). Larger and broader, lanceolate; nerve running to a point; margin not recurved (*plane*).

Flowers and Fruit. Dioicous; seta long, straight; capsule ovate.

Locality. Moist banks, generally near the sea.

FIG. 4. TRICHOSTOMUM FLAVOVIRENS.

*Yellow-green Hair Moss (a).**Colour.* Yellow green.*Stems.* Short, tufted.*Leaves (b).* Linear-lanceolate, large, crisped when dry, tufted at the end.*Capsule.* (?)*Locality.* Sussex. Mr. Mitten.

FIG. 5. TRICHOSTOMUM TOPHACEUM.

*Blunt-leaved Hair Moss (a).**Colour.* Deep green.*Stems.* Tufted, with long slender shoots (*innovations*).*Leaves (b).* Broadly lanceolate, smaller below.*Flowers and Fruit.* Dioicous. Seta long, capsule ovate-cylindrical, erect.

Autumn.

Locality. Moist rocks.

FIG. 6. TRICHOSTOMUM RIGIDULUM.

*Stiff-leaved Hair Moss (a).**Colour.* Brownish green.*Stems.* Simple or branched, in tufts; one inch or more in length.*Leaves (b).* Spreading, stiff and thick, oblong-lanceolate; keeled, margin recurved.*Flowers and Fruit.* Dioicous. Capsule cylindrical, seta long and slender.

Winter.

Locality. Moist places, and near waterfalls.

FIG. 7. TRICHOSTOMUM NEGLECTUM.

*Neglected Hair Moss (a).**Colour.* Dull green.*Stems.* Simple or branched, in tufts; half-inch long.*Leaves (b).* Rather spreading, lanceolate, suddenly narrowed above the middle; the nerve running to a point.*Flowers and Fruit.* Dioicous. Capsule oval, erect.



II. *Leaves subulate, base lanceolate.*

FIG. 8. TRICHOSTOMUM TORTILE.

Twisted-leaved Hair Moss (a).

Colour. Dull green.

Stems. Short, many together, but not tufted (*gregarious*).

Leaves (b). Subulate, base lanceolate, twisted when dry; set sickle-wise (*falcate*).

Flowers and Fruit. Dioicous. Capsule very small, oval. Winter.

Locality. On sandy banks. Rare.

FIG. 9. TRICHOSTOMUM FLEXICAULE.

Slender-stemmed Hair Moss (a).

Colour. Yellowish green.

Stems. Very slender and long, waved and bent, tufted.

Leaves (b). Subulate, long, bent when dry, smaller below; glossy. Fructification unknown in Britain.

Locality. On mountain rocks.

FIG. 10. TRICHOSTOMUM HOMOMALLUM.

Curved-leaved Hair Moss (a).

Colour. Yellow green; seta red.

Stems. Slender, branched or simple; tufted.

Leaves (b). Subulate, twisting; nerve broad.

Flowers and Fruit. Dioicous. Seta very long and slender. Capsule oval, small. Winter.

Locality. Sandy banks.

FIG. 11. TRICHOSTOMUM GLAUCEUSCEUS.

Glaucous Hair Moss (a).

Colour. Deep glaucous green.

Stems. Short, in dense tufts.

Leaves. Lanceolate, or linear-lanceolate; nerve excurrent.

Flowers and Fruit. Monoicous. Capsule oval, seta rather short. Summer.

Locality. On Scottish mountains.

PLATE XIII.

TRICHOSTOMEÆ. PART III.

TORTULA.

FIG. 1. GENERIC CHARACTER.

Much resembling *Trichostomum*, but the stems are generally shorter, and the leaves proportionately large. The chief characteristic of the genus is the peristome. This is single, composed of thirty-two teeth, bright red, twisted round each other (*a*), whence the name of the genus, *Tortula* or Screw Moss. The capsule (*b*) is cylindrical, and furrowed lengthwise.

The Screw Mosses are among the most abundantly distributed of all the species; they may be found upon almost every wall, and hardy and brave, they venture nearer to the smoke of London than any other. No Mosses add more to the beauty of our every-day sights. Their round green and grey cushions, with red "clumps of spears"* rising from them, shining in the sun, glistening in the rain, fill the same home-place among Mosses as daisies do among flowers, and robins among birds.

I. *Leaves rigid, covered on the upper side with filaments rising from the nerve; nerve broad.*

FIG. 2. TORTULA RIGIDA.

Rigid Screw Moss (a).

Colour. Yellow green.

Stems. Short.

Leaves (b). Oblong, margin reflexed.

Flowers and Fruit. Dioicous. Capsule elliptic, erect; peristome very much twisted; calyptra half covering the capsule. Winter.

Locality. On walls, in limestone and chalk.

* "Could call up Arthur and his peers

By some low moss's clump of spears."—LOWELL.



FIG. 3. TORTULA AMBIGUA.

*Doubtful Screw Moss (a).**Colour.* Yellow green.*Stems.* Short.*Leaves (b).* Tongue-shaped (*lingulate*), larger than in the last species; margin incurved.*Flowers and Fruit.* Dioicous. Capsule cylindrical, erect; calyptra very short; peristome slightly twisted. Winter.*Locality.* Common on walls and banks.

FIG. 4. TORTULA ALOIDES.

*Aloe-leaved Screw Moss (a).**Colour.* Yellow green.*Stems.* Short.*Leaves (b).* Very rigid, lanceolate, acute; nerve strong.*Flowers and Fruit.* Dioicous. Capsule *oblique*, cylindrical; teeth very slightly twisted; Calyptra short. Winter.*Locality.* On banks.II. *Nerve naked, narrow.*

Leaves lanceolate or narrow.

1. Leaves almost straight when dry.

FIG. 5. TORTULA UNGUICULATA.

*Bird's-claw Screw Moss (a).**Colour.* Yellow green.*Stems.* Much tufted, branched, longer.*Leaves (b).* Oblong-lanceolate, obtuse.*Flowers and Fruit.* Dioicous. Capsule nearly cylindrical, erect; lid awl-shaped (*subulate*). Winter.*Locality.* Banks.

FIG. 6. TORTULA FALLAX.

Fallacious Screw Moss (a).

Colour. Yellow green.

Stems. Branched, tufted.

Leaves (b). Spreading, lanceolate; margin recurved.

Flowers and Fruit. Dioicous. Capsule nearly cylindrical; lid rostrate. Winter.

Varieties. *Brevicaulis*.—stems short; leaves wavy in the margin.

Brevifolia.—Leaves short.

Recurvifolia.—Leaves widely spreading, recurved (FIG. 7, *a*, *b*). Now considered a species.

Locality. Banks, in clayey soils.

FIG. 8. TORTULA VINEALIS.

Soft-tufted Screw Moss (a).

Colour. Yellow green.

Stems. Tufted, long.

Leaves (b). Linear-lanceolate.

Flowers and Fruit. Dioicous; seta very long; capsule thicker and elliptical, with an annulus. Spring.

Locality. Common on walls.

2. Leaves twisted when dry.

FIG. 9. TORTULA TORTUOSA.

Curly-leaved Screw Moss (a).

Colour. Emerald green.

Stems. Long, branched.

Leaves (b). Very long, in a large tuft at the end of the stem, much twisted.

Flowers and Fruit. Dioicous. Capsule ovate. Summer.

Locality. Limestone rocks.

FIG. 10. *TORTULA SQUARROSA.**Spreading-leaved Screw Moss (a).**Colour.* Emerald green.*Stems.* Long, tufted.*Leaves (b).* Spreading out flat (*squarrose*). Capsule not found in Britain.*Locality.* Chalk hills.

3. Leaves very much turned back in the margin, perichætical leaves sheathing.

FIG. 11. *TORTULA REVOLUTA.**Roll-leaved Screw Moss (a).**Colour.* Yellow green.*Stems.* Short, in thick close patches.*Leaves (b).* Nearly erect, oblong; nerve thick.*Flowers and Fruit.* Dioicous. Capsule small. Seta red. Spring.*Locality.* On walls, principally limestone.FIG. 12. *TORTULA HORNSCHUCHIANA.**Dull Green Screw Moss (a).**Colour.* Dull green.*Stems.* In loose, soft patches.*Leaves (b).* Rather spreading, acute.*Flowers and Fruit.* Dioicous. Capsule rather long and curved. Spring.*Locality.* Walls, rocks, and banks.4. Leaves with flat (*plane*) margins; those of the perichætium longer.FIG. 13. *TORTULA CONVOLUTA.**Sheath-leaved Screw Moss (a).**Colour.* Yellow green.*Stems.* Very short, thickly tufted.

Leaves (b). Small, oblong-lanceolate.

Flowers and Fruit. Dioicous. Capsule oblong-ovate; lid subulate.

Locality. Walls and bare places.

FIG. 14. *TORTULA CUNEIFOLIA.*

Wedge-leaved Screw Moss (a).

Colour. Yellow green.

Stems. Short, growing many together, but not tufted (*gregarious*).

Leaves. Large, wedge-shaped.

Flowers and Fruit. Monoicous. Capsule oval; seta long. Spring.

Locality. On banks near the sea. Rare.

FIG. 15. *TORTULA OBLONGIFOLIA.*

Strap-leaved Screw Moss (a).

Colour. Emerald green.

Stems. Short, gregarious.

Leaves (b). Strap-shaped; nerve running to a point.

Flowers and Fruit. Monoicous. Capsule cylindrical. Winter.

Locality. Moist banks near Dublin. Mr. Drummond, in "Bryologia Britannica."

FIG. 16. *TORTULA OBLONGIFOLIA.*

Wilson's Strap-leaved Screw Moss (a).

Colour. Yellow green.

Stems. Short, gregarious.

Leaves (b). Strap-shaped, narrower than the last; nerve in a longer point.

Flowers and Fruit. Monoicous (?). Capsule subulate; seta slightly curved.

Locality. (?).

FIG. 17. *TORTULA MURALIS*.*Wall Screw Moss (a).*

Colour. Emerald green, with white hairs.

Stems. Short, in thick cushions.

Leaves (b). Oblong, the nerve running into a hair-like point; margins recurved.

Flowers and Fruit. Monoicous. Capsule oblong; seta red. Spring.

Locality. Abundant upon walls.

Varieties. *Incana*.—Shorter and smaller; hair-points of leaves very long.

Æstiva.—Stems more slender; leaves narrower.

Rupestris (Fig. 18).—Larger; leaves oblong, darker green, very hoary; capsule long, curved.

FIG. 19. *TORTULA MARGINATA*.*Border-leaved Screw Moss (a).*

Colour. Yellow green.

Stems. Short, not branched, gregarious.

Leaves (b). Lanceolate, margin thickened; nerve excurrent.

Flowers and Fruit. Monoicous. Capsule cylindrical. Summer.

Locality. On sandstone walls. Rare.

FIG. 20. *TORTULA AUGUSTATA*.*Upright Screw Moss (a).*

Colour. Yellow green.

Stems. Short, gregarious.

Leaves (b). Lanceolate, acute.

Flowers and Fruit. Monoicous (?). Capsule cylindrical; lid subulate.

Locality. Near Ringway, Cheshire. Mr. Wilson.

5. Plants with the lower portion of the peristome united into a tube.

FIG. 21. *TORTULA SUBULATA*.

Awl-leaved Screw Moss (a).

Colour. Dark green.

Stems. Short, tufted.

Leaves (b). Oblong-ovate; nerve in long point.

Flowers and Fruit. Monoicous. Capsule large and long, cylindrical. Summer.

Locality. Hedge banks.

Variety. *Subinerucis*.—Leaves crowded; point, hardly any; capsule short.

6. Plants taller, branched.

FIG. 22. *TORTULA LATIFOLIA*.

Wide-leaved Screw Moss (a).

Colour. Yellow green.

Stems. In patches.

Leaves (b). Spreading, recurved, crisped when dry; nerve hardly excurrent.

Flowers and Fruit. Dioicous. Capsule oblique, small; very rare. Summer.

Locality. About trees and in damp places.

FIG. 23. *TORTULA LEVIPILA*.

Small Hairy Screw Moss (a).

Colour. Dark, with emerald green tips.

Stems. Tufted.

Leaves (b). Spreading, ovate-oblong; nerve running into a long white point.

Flowers and Fruit. Monoicous; capsule curved, cylindrical; peristome almost wholly tubular. Summer.

Locality. Trees and rocks.

FIG. 24. *TORTULA RURALIS*.

Great Hairy Screw Moss (a).

Colour. Dark, tipped with yellow green.

Stems. Long and branched; tufted.

Leaves (b). Spreading, recurved, obtuse; the points very long; margin recurved.

Flowers and Fruit. Dioicous; capsule long and curved; lid with long beak. Spring.

Locality. On walls and roofs; abundant.

FIG. 25. *Variety found on sand-hills.*

Colour, brown and yellow green; stems, much longer; leaves very large, hair-point almost as long as the leaf; capsule curved.

FIG. 26. *TORTULA INTERMEDIA.*

Intermediate Screw Moss (a).

Colour. Dark green.

Stems. Long, branched.

Leaves (b). Oblong, obtuse; with a long hair point.

Flowers and Fruit. Dioicous (?); capsule curved; lid subulate. Spring.

Locality. On walls.

FIG. 27. *TORTULA MULLERI.*

Brown Screw Moss (a).

Colour. Light brown.

Stems. Long, covered with roots.

Leaves (b). Thick in texture, growing in tufts round the stem, spreading, oval.

Flowers and Fruit. Synoicous; capsule curved. Spring.

Locality. Rocks in Scotland.

FIG. 28. *TORTULA PAPILLOSA.*

Rough-leaved Screw Moss (a).

Colour. Very dark green.

Stems. Short, tufted.

Leaves (b). Spreading, oval, concave, hair-pointed; covered on the nerve and bark with glands (*papillæ*); margin turned in; nerve thick.

Inflorescence not known.

Locality. On trees.

SUB-ORDER IX.

RIPARIÆ.

CHARACTERISTICS OF ORDER.

Plants large, growing in water, with floating stems, attached by the base to stones or wood ; fructification, either from the summit (*acrocarpous*), or from side branches (*cladocarpous*) ; peristome single. See *Fontinalis*, in the *side-fruited* (*pleurocarpous*) section. It is probable from the general habit, and even the structure of the peristome, bearing so much resemblance to *Fontinalis* that the two orders should be united in one.

PLATE XIV.

CINCLIDOTUS.

FIG. 1. LATTICE MOSS.

Generic Character.

Capsule (*a*) either immersed or on a pedicel, much furrowed (*b*) ; peristome (*a*) twisted into a cone, composed of thirty-two very long teeth, adhering to the summit of the columella, united at the base by a membrane, pierced with holes like lattice-work (*c*), whence is derived the name of the moss. Areolæ (*d*) very small ; texture of the leaf thick.

I. *Acrocarpous*.

FIG. 2. CINCLIDOTUS RIPARIUS (VARIETY TERRESTRIS).

Great Water Screw Moss (a).

Colour. Glaucous green.

Stems. Erect, slightly branched.

Leaves (b). Spreading, oblong-lanceolate ; margins thickened ; nerve excurrent.

Flowers and Fruit. Dioicous ; seta short and thick ; capsule elliptic ; lid oblique.

Spring.

Locality. On stones, &c. near water.

The true form is not known in Britain.



II. *Cladocarpous*.

FIG. 3. CINCLIDOTUS FONTANALOIDES.

*Smaller Water Screw Moss (a).**Colour.* Blackish green.*Stems.* Long, floating, branched.*Leaves (b).* Lanceolate, keeled; nerve excurrent, those of the perichætium sheathing.*Flowers and Fruit.* Dioicous; capsules immersed; very abundant. Spring.*Locality.* On rocks and stones in water.

SUB-ORDER X.

ENCALYPTEÆ. (FIGS. 4—9.)

FIG. 4. CHARACTERISTICS OF ORDER.

Mosses tufted, erect; leaves in five rows, linear or lanceolate; capsule (Fig. 4) on a long seta, entirely enveloped in the bell-shaped calyptra, which remains until the lid falls off; peristome single or double, very variable, generally of thirty-two teeth united in pairs. Perennial, on rocks and on earth.

(a). Peristome none.

FIG. 5. ENCALYPTA COMMUTATA.

*Sharp-leaved Extinguisher Moss (a).**Colour.* Brownish green.*Stems.* Half-inch to one inch long, branched, with roots (*radiculose*).*Leaves (b).* Spreading, base sheathing, incurved when dry, lanceolate; nerve excurrent.*Flowers and Fruit.* Monoicous, lid beaked. Summer.*Locality.* On the summits of the Scottish mountains.

(b). Peristome single.

1. Peristome very fugacious.

FIG. 6. ENCALYPTA VULGARIS.

Common Extinguisher Moss (a).

Colour. Dull green.

Stems. Short, radiculose.

Leaves (b). Spreading, oblong-lanceolate; nerve excurrent, or sometimes ceasing below the apex.

Flowers and Fruit. Monoicous. Seta short, twisted; capsule thin, rather conical; teeth of peristome very irregular. Spring.

Locality. Walls and rocks.

2. Peristome persistent.

FIG. 7. ENCALYPTA CILIATA.

Fringed Extinguisher Moss (a).

Colour. Yellow green.

Stems. Branched, radiculose.

Leaves (b). Ligulate or oblong-ovate, crisped when dry; margin recurved below; nerve excurrent.

Flowers and Fruit. Monoicous. Capsule cylindrical, calyptra fringed at the base. Summer.

Locality. Mountainous rocks.

FIG. 8. ENCALYPTA RHABDOCARPA.

Rib-fruited Extinguisher Moss (a).

Colour. Yellow green.

Stems. Branched, radiculose, short.

Leaves (b). Spreading, lanceolate or ovate-oblong; nerve excurrent, hair-pointed.

Flowers and Fruit. Monoicous. Capsule oblong, furrowed and ribbed when dry. Summer.

Locality. Irish and Scottish mountains.

(c). Peristome double.

FIG. 9. ENCALYPTA STREPTOCARPA.

Spiral-fruited Extinguisher Moss (a).

Colour. Dark brownish green.

Stems. Long, radiculose.

Leaves (b). Erect, spreading, ligulate; nerve ceasing at the summit.

Flowers and Fruit. Dioicous. Capsule cylindrical, ribbed spirally. Autumn.

Locality. On limestone walls, or banks.

SUB-ORDER XI.

HEDWIGIÆ. (FIGS. 10—13.)

CHARACTERISTICS OF ORDER.

Stems long, branched, rooting at the base; leaves nerveless; capsule globular; peristome none.

HEDWIGIA.

GENERIC CHARACTER. (FIG. 10.)

Stems regularly branched in forks (*dichotomous*). Capsule (*a*) immersed.

FIG. 11. HEDWIGIA CILIATA.

Hoary-branched Beardless Moss (a).

Colour. Hoary green.

Stems. Long, branched, in loose patches.

Leaves (b). Crowded, ovate-lanceolate, with transparent points.

Flowers and Fruit. Monoicous. Capsule bright red, immersed. Spring.

Locality. Mountainous rocks.

Variety (c). *Striata*. Leaves plaited lengthwise.

HEDWIGIUM.

GENERIC CHARACTER. (FIG. 12.)

Capsule on a pedicel; stems irregularly branched, sending out root-like shoots from their extremities (*flagellæ*).

FIG. 13. HEDWIGIUM IMBERBE.

*Green-branched Beardless Moss (a).**Colour.* Hoary green.*Stems.* Irregularly branched, in patches.*Leaves (b).* Ovate-lanceolate, plaited lengthwise (*plicate*).*Flowers and Fruit.* Monoicous. Capsule on a very short pedicel. Autumn.*Locality.* Faces of rocks.

SUB-ORDER XII.

GRIMMIEÆ.

PLATE XV.

CHARACTERISTICS OF ORDER.

Stems much branched, in tufts, erect or trailing (procumbent), growing on rocks; leaves in eight rows, areolæ small; capsule immersed, or on short pedicel; peristome generally of sixteen teeth, absent in one species; plants hoary and rather coarse looking. This order has a great affinity with *Hedwigieæ*, with which probably it ought to be united.

SCHISTIDIUM. (Figs. 1—5.)

GENERIC CHARACTER. (FIG. 1.)

Capsule (*a*) round; mouth wide; columella united to the lid and falling away with it (*b*). Calyptra small; base much torn. Monoicous. Leaves, hair pointed and white at the apex, whence arises the hoary appearance of the plant; becoming larger and tufted towards the summit; margins reflexed.

FIG. 2. SCHISTIDIUM CONFERTUM.

Close-tufted Grimmia (a).

Colour. Blackish, tipped with bright green.

Stems. Branched, tufted closely, very rigid when dry.

Leaves (b). Erect when dry; margin rather thickened; areolæ very small; the upper with a short hair-point.

Capsule. Small, of thin texture. Spring.

Locality. Trap or sandstone rocks. The King's Park, Edinburgh. Dr. Greville in "Bryologia Britannica."

FIG. 3. SCHISTIDIUM PRUINOSA.

*Black Grimmia (a).**Colour.* Blackish.*Stems.* Branched, tufted.*Leaves (b).* With long white hair points, erect, spreading, very thickly crowded.*Capsule.* Very small, completely hidden by the leaves. Spring (?).*Locality.* Near Largo, Scotland, 1864. Mr. Wilson.

FIG. 4. SCHISTIDIUM APOCARPUM.

*Sessile-fruited Grimmia (a).**Colour.* Brownish.*Stems.* In loose tufts; branches long and very much forked.*Leaves (b).* Base broad, ovate-lanceolate above, with white points.*Capsule.* Of stout texture, elliptical; annulus, none. Winter.*Locality.* Rocks and walls.*Varieties.* *Gracile (c).*—Stems longer, leaves following each other (*secund*).*Rivulare (d).*—Dark green, leaves wide, ovate-lanceolate, obtuse. By streams.

FIG. 5. SCHISTIDIUM MARITIMUM.

*Sea-side Grimmia (a).**Colour.* Greenish brown.*Stems.* In round, thick tufts.*Leaves (b).* Crowded, long, incurved when dry, lanceolate; nerve excurrent.*Capsule.* Annulus, none; teeth large, longer than in the other species, and very abundant. Autumn and Winter.*Locality.* One of the few mosses found on rocks exposed to the sea; very rare on calcareous rocks, but abundant on slate, where its round, thick tufts mark it at once.



GRIMMIA (FIGS. 6—19).

GENERIC CHARACTER (FIG. 6).

Very similar to *Schistidium*, but the capsule (*a*) generally oval, either smooth or ribbed; the lid (*b*) falling away separate from the columella, which shrinks into the capsule; Calyptra mitre-shaped (*mitriform*), in five lobes at the base. Areolæ (*c*) very small.

1. CURVISETÆ (CURVE-STALKED).

I. *Pulvinatæ*. *Monoicous*.

FIG. 7. GRIMMIA PULVINATA.

Grey-cushioned Grimmia (a).

Colour. Light green, very hoary.

Stems. In thick tufts.

Leaves (b). Lanceolate, suddenly running to a long white point.

Capsule. Oval, with eight furrows, drooping; lid rostrate; peristome red; annulus large. Spring.

Locality. On walls and rocks.

Variety. *Obtusa (c).*—Stem short, leaves narrower, lid short.

FIG. 8. GRIMMIA ORBICULARIS.

Round-fruited Grimmia (a).

Colour. Brown, tipped with green.

Stems. In thick tufts.

Leaves (b). Oblong-lanceolate, with a very long point.

Capsule. When ripe, bright red, rather thin; lid scarcely beaked. Spring.

Locality. Calcareous rocks.

II. *Stems tufted, slender; leaves lanceolate; capsule small. Trichophyllæ.*

FIG. 9. GRIMMIA SPIRALIS.

Spiral-leaved Grimmia (a).

Colour. Brown.

Stems. Long and slender.

Leaves (c). Lanceolate, long, with very long points, spirally twisted round the stem when dry.

Capsule. Very small, the pedicel scarcely rising above the long perichæatial leaves.

Rare. Autumn.

Locality. On dry rocks among mountains.

FIG. 10. GRIMMIA TORTA.

Twisted-leaved Grimmia (a).

Colour. Greenish brown.

Stems. Slender, flexible, tufted.

Leaves (b). In three rows, twisted when dry; nerve channelled; hair-point very short.

Always barren, but jointed filaments are observed among the leaves.

Locality. Common on Alpine rocks.

FIG. 11. GRIMMIA TRICHOPHYLLA.

Hair-pointed Grimmia (a).

Colour. Yellowish green.

Stems. In loose tufts.

Leaves. Very long, linear-lanceolate, *gradually* tapering to a white point.

Flowers and Fruit. Dioicous. Capsule elliptical, furrowed when dry. Spring.

Locality. Not uncommon upon walls; but rare in fruit.

III. *Plants much larger in all their parts. Lid with long beak. Elatiores.*

Monoicous.

FIG. 12. GRIMMIA SCHULTZII.

Great Grimmia (a).

Colour. Yellowish green.

Stems. Branched and tufted, very tall.

Leaves (b). Much crowded, lanceolate, with recurved margins, gradually tapering to a rough point.

Capsule. Seta short, much curved; annulus large; teeth very long and slender; the upper part generally falling with the lid. Summer.

Locality. Sub-alpine rocks.

FIG. 13. GRIMMIA HARTMANII.

Hartmann's Grimmia (a).

Colour. Yellow green.

Stems. Branched, tufted.

Leaves (b). Long, linear-lanceolate, hair-point short.

Barren in Britain.

Locality. Near Conway.

Dioicous.

FIG. 14. GRIMMIA PATENS.

Spreading-leaved Grimmia (a).

Colour. Greenish black.

Stems. Long, tufted, leaves few at the base.

Leaves (b). Rather obtuse, very spreading; nerve with two wings.

Capsule. Furrowed when dry; seta much curved; often appearing to be from the side, in consequence of the branching of the stem. Spring.

Locality. Moist rocks.

2. RECTISETÆ (STRAIGHT FRUIT-STALK).

- I. *Stems tufted, leaves hair-pointed, calyptra mitriform, lobed at the base. Leucophæa.*

(a). Monoicous.

FIG. 15. GRIMMIA DONNIANA.

Apple-fruited Grimmia (a).

Colour. Dark green.

Stems. Short, in thick tufts.

Leaves (b). Lanceolate, narrow, tapering into hair-points, erect.

Capsule. Erect, round, annulus small. Winter.

Locality. Rocks and walls, in mountainous districts.

FIG. 16. GRIMMIA OVATA.

Oval-fruited Grimmia (a).

Colour. Brownish green.

Stems. Longer, tufted, branched.

Leaves (b). Spreading, erect when dry, lanceolate.

Capsule. Of thick texture, erect, oval. Winter.

Locality. Alpine rocks.

(b). Dioicous.

FIG. 17. GRIMMIA LEUCOPHÆA.

Hoary Grimmia (a).

Colour. Very dark green.

Stems. Short, tufted.

Leaves (b). Erect, spreading, ovate, concave, with extremely long hair-points.

Capsule. Erect, elliptical. Spring.

Locality. On trap rocks. Not common. Scotland, in many places ; also in Devonshire.

II. *Leaves without hair-points. Capsule rather oblique.*
Dioicous.

FIG. 18. GRIMMIA UNICOLOR.

Dingy Grimmia (a).

Colour. Black.

Stems. Long, branched, tufted loosely, fastigiate.

Leaves (b). Thick, opaque, margin inflexed, without hair-points, very obtuse, lanceolate.

Capsule. Yellow brown, smooth, slightly oblique; calyptra oblique. Spring (?)

Locality. Alpine rocks.

FIG. 19. GRIMMIA ATRATA.

Tufted Black Grimmia (a).

Colour. Brownish black.

Stems. Branched, more closely tufted.

Leaves (b). Thinner than in the last species; margin reflexed; nerve thinner, not so obtuse.

Capsule. Longer and larger, yellow-brown when young, black when old. Winter.

Locality. Alpine rocks. Rare. Clogwyn-y-Garuedd, Snowdon, Glen Callater.
("Bryologia Britannica.")



PLATE XVI.

RACOMITRIUM.

FIG. 1. GENERIC CHARACTER.

Capsule (*a*) erect, smooth, elliptical or cylindrical; lid conical-subulate, straight, or slightly oblique; annulus very large; calyptra conical, mitre-shaped, much divided at the base; peristome (*b*) of sixteen thread-like (*filiform*) teeth, very irregular, long in some species, short in others. Stems long, dichotomously branched; branches mostly of equal height (*fastigate*); leaves often hair-pointed, areolæ (*c*) very minute, disposed in rows, forming elongated cellules.

Growing in thick cushions and tufts upon rocks in mountainous districts; very woolly.

I. *Stems dichotomously branched; branches (innovations) fastigate, simple. (Dryptodon of some botanists.)*

FIG. 2. RACOMITRIUM ELLIPTICUM.

Oval-fruited Woolly Moss (a).

Colour. Blackish.

Stems. The shortest of the genus, about one inch in length.

Leaves (b). Lanceolate-oblong, thick and rigid; nerve very strong, margin thickened.

Flowers and Fruit. Dioicous; capsule roundish; seta short and stout. Winter.

Locality. Moist Alpine rocks, micaceous or schistose.

FIG. 3. RACOMITRIUM ACICULARE.

Yellow Woolly Moss (a).

Colour. Yellow green.

Stems. Long, loosely tufted, upright; very leafy.

Leaves (b). Broad, nerve ceasing below the apex; margin recurved.

Flowers and Fruit. Dioicous. Capsule cylindrical; lid long. Winter.

Locality. Wet rocks, near mountains.



FIG. 4. RACOMITRIUM PROTENSUM.

*Sage-coloured Woolly Moss (a).**Colour.* Sage green.*Stems.* Long, slender, not rigid ; leafy to the base.*Leaves (b).* Spreading, lanceolate-subulate, obtuse.*Flowers and Fruit.* Dioicous. Capsule nearly cylindrical, teeth of peristome short. Spring.*Locality.* Moist rocks.

FIG. 5. RACOMITRIUM SUDETICUM.

*Slender Woolly Moss (a).**Colour.* Brownish green, grey with hairs.*Stems.* Long, slender, branched dichotomously ; base decumbent.*Leaves (b).* Base erect, spreading, lanceolate with white transparent (*diaphanous*) points.*Flowers and Fruit.* Dioicous ; capsule small, pale in colour, elliptical ; seta short. Spring.*Locality.* Alpine rocks.

II. *Stems irregularly branched ; branches lateral, not fastigate.*
(Racomitrium of some botanists.)

FIG. 6. RACOMITRIUM FASCICULARE.

*Bundled Woolly Moss (a).**Colour.* Yellow green.*Stems.* Long, branches in bunches, short.*Leaves (b).* Spreading, recurved, lanceolate ; margin recurved.*Flowers and Fruit.* Dioicous ; capsule elliptical ; lid long and subulate ; teeth of peristome very long ; annulus large. Spring.*Locality.* Common on rocks.

FIG. 7. *Racomitrium heterostichum*.*Bristly Woolly Moss (a).*

Colour. Sage green, hoary.

Stems. Long, branches in bunches (*fasciculate*).

Leaves (b). Lanceolate, with diaphanous points; margin recurved; areolæ longer towards the base.

Flowers and Fruit. Dioicous; capsules large and abundant, mouth small. Spring.

Locality. Abundant on rocks and walls.

Varieties. *Alopecurum (c)*.—Slender, branches shorter; white points of leaves short and obscure. Common.

Gracilescens (d).—Branches short, nerve small; peristome small. Common.

FIG. 8. *Racomitrium lanuginosum*.*Grey Woolly Moss (a).*

Colour. Sage green, remarkably hoary.

Stems. Very long and slender, forming thick and elastic cushions.

Leaves (b). Very long, lanceolate; tapering into remarkably long hair-points.

Flowers and Fruit. Dioicous. Capsule seldom visible until the plant is gathered, as it is small, and from the short seta concealed among the branches.

Locality. Abundant in moorland and mountain districts, where it forms one of the most marked features of the vegetation.

FIG. 9. *Racomitrium canescens*.*Hoary Woolly Moss (a).*

Colour. Yellow green, hoary.

Stems. Long, branches fasciculate.

Leaves (b). Ovate-lanceolate, tapering into rough diaphanous points.

Flowers and Fruit. Dioicous. Capsules abundant, ovate, largish; seta very long. Spring.

Locality. Common in stony places, but seldom on rocks.

PLATE XVII.

PTYCHOMITRIÆ.

CHARACTERISTICS OF ORDER.

Plants tufted, on rocks; stems forked (*dichotomous*); branches of equal height (*fastigate*); leaves lanceolate; areolæ minute; capsule erect; beak straight; peristome single, of sixteen teeth; calyptra very large, and furrowed; apex very small. Figs. 1 (*b*), 3 (*b*).

GLYPHOMITRION.

FIG. 1. GENERIC CHARACTER.

Minute plants in tufts; capsule (*a*) roundish; beak short; calyptra (*b*) large, bladder-like; peristome (*c*) inserted below the mouth of capsule; teeth short and wide, in pairs, with external bars, turned back when dry.

FIG. 2. GLYPHOMITRION DAVIESII.

Black-tufted Moss (a).

Colour. Greenish black.

Stems. Very short, tufted.

Leaves (b). Linear-lanceolate, crisped when dry; nerve strong and thick.

Flowers and Fruit. Monoicous. Seta short; capsule round, entirely covered by the calyptra. Summer.

Locality. Rocks near the sea.

PTYCHOMITRIUM.

FIG. 3. GENERIC CHARACTER.

Capsule (*a*) oval; beak straight, long; calyptra (*b*) very much furrowed, many times divided at the base; peristome (*c*) of sixteen teeth, divided almost to the base, the divisions thread-shaped (*filiform*); not affected by damp.

FIG. 4. PTYCHOMITRIUM POLYPHYLLUM.

Many-leaved Fringe Moss (a).

Colour. Dark green.

Stems. Tufted, branched, one inch and a-half long.

Leaves. Linear-lanceolate, broader at the base, serrated at the point.

Flowers and Fruit. Monoicous. Perichaetium none; seta slender; capsule oval and regular. Spring.

Locality. Mountainous rocks.













